MAY 1949

Plant Engineering

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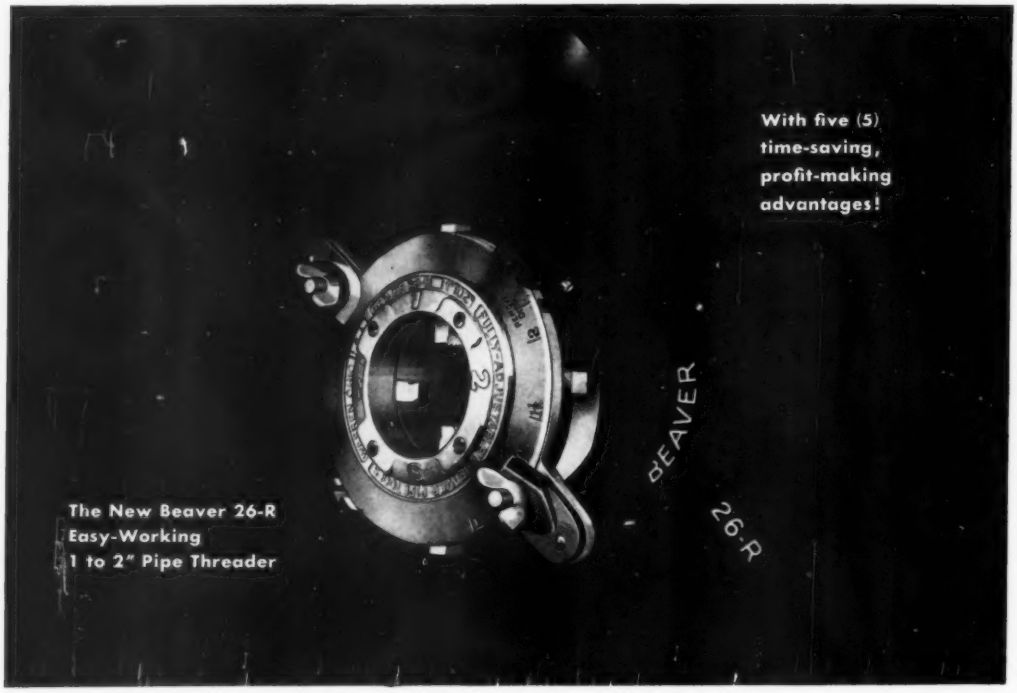
Volume 3, No. 5

The magazine that helps plant engineers with their everyday problems



A New and Better 1 to 2-inch Threader!

● The new Beaver 26-R is the ONLY fully-adjustable, easy-working 1 to 2" pipe threader which will cut standard, oversize and undersize threads of uniform length.

The new Beaver 26-R is the ONLY tool of its kind which will cut either standard "taper" or electric "straight" conduit threads by a simple adjustment requiring no tools.

The new Beaver 26-R is the ONLY tool of its kind with "radio" dial size-setting . . . from which the dies can be removed in a few seconds FROM THE OUTSIDE without the use of tools.

The new Beaver 26-R is the greatly improved successor to the "old Beaver 26," the original 1 to 2" self-contained threader which has been popular the world over for the past 35 years.

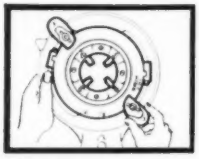
The new Beaver 26-R uses one set of dies to thread four sizes (1, 1¼, 1½ and 2-inch) . . . is fully adjustable for oversize or undersize threads to compensate for variation in fittings . . . and has a cam-type universal self-centering chuck which centers the pipe accurately and insures straight pipe lines. Yet, "drip threads" may be cut when desired for heating lines.

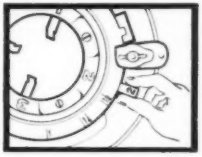
Now available at all leading supply houses—don't accept substitutes!

May we send you new Beaver Catalog CC-49? Address Beaver Pipe Tools, Inc., 200-600 Dana Avenue, Warren, Ohio, U. S. A.

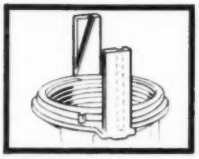
BEAVER PIPE TOOLS

Radio Dial . . . visible, easy, accurate die setting mechanism. A Beaver exclusive.



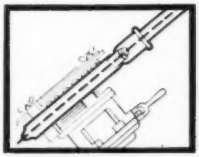


Dies instantly removable . . . from the outside . . . no tools required!

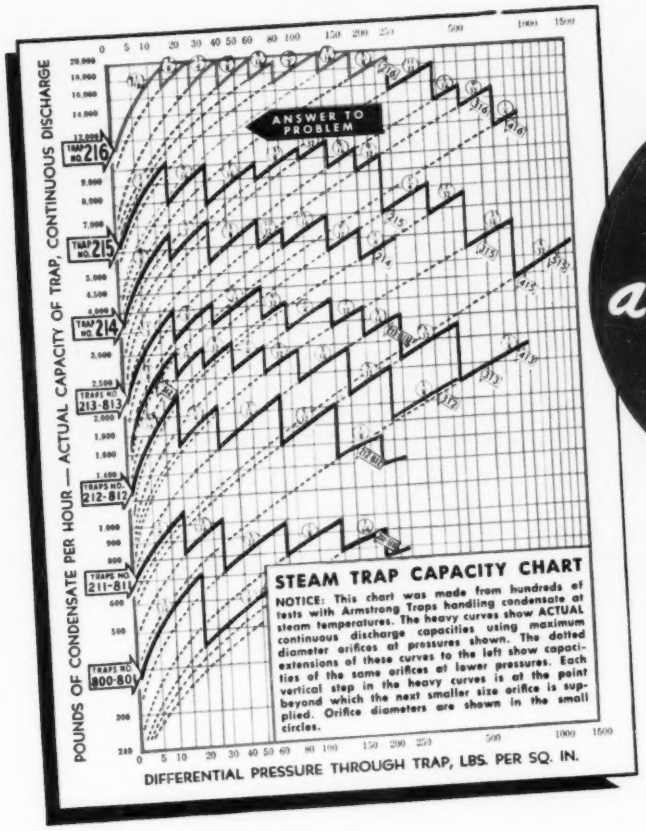


Instantly adjustable to cut either standard taper or straight electric conduit threads.

Self-centering, universal chuck insures accurate alignment; also adjustable for cutting "drip" threads!



Straight line pull . . . in same plane as dies. Easy cutting . . . maximum efficiency!


ANSWER TO PROBLEM
TRAP NO. 216
TRAP NO. 215
TRAP NO. 214
TRAPS NO. 213-813
TRAPS NO. 212-812
TRAPS NO. 211-811
TRAPS NO. 800-801
POUNDS OF CONDENSATE PER HOUR — ACTUAL CAPACITY OF TRAP, CONTINUOUS DISCHARGE
DIFFERENTIAL PRESSURE THROUGH TRAP, LBS. PER SQ. IN.
STEAM TRAP CAPACITY CHART
NOTICE: This chart was made from hundreds of tests with Armstrong Traps handling condensate at steam temperatures. The heavy curves show ACTUAL continuous discharge capacities using maximum diameter orifices at pressures shown. The dotted extensions of these curves to the left show capacities of the same orifices at lower pressures. Each vertical step in the heavy curves is at the point beyond which the next smaller size orifice is supplied. Orifice diameters are shown in the small circles.

BECAUSE good trapping starts with selection of the right trap for the job, Armstrong has provided all the data necessary for correct trap selection in the Armstrong Steam Trap Book. The Capacity Chart reproduced here is taken from this handy reference work. By means of this chart, any engineer can select the correct traps for his requirements. Here is a typical problem showing how the chart is used:

Given: An evaporator condensing 6000 lbs/hr at 50 psi when the steam is first turned on, but condensing only 1000 lbs/hr at 150 psi at the end of the process. Safety factor of 2 to 1 required at the *minimum* pressure differential.

Solution: Referring to the chart, the No. 216 Armstrong Trap with 7/16" orifice for 150 psi pressure has a capacity of 12,000 lbs/hr at 50 psi. This provides for the 2 to 1 safety factor and is, therefore, the correct trap for the job.

The Armstrong Steam Trap Book provides recommended safety factors for different services and handy tables to help you calculate condensing rates. Other useful data included are: hook-up diagrams; do's and don't's; trouble-shooting tips; prices and specifications. You're welcome to a copy. **ARMSTRONG MACHINE WORKS, 912 Maple Street, Three Rivers, Michigan.**

ARMSTRONG *Inverted Bucket* **STEAM TRAPS**

For fuel savings, low maintenance, automatic air removal SPECIFY ARMSTRONG!

PLANT ENGINEERING

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'Round About with the Editors

From PE Readers— On MH and Other Issues

I THINK it is one of the finest magazines ever published for plant engineers and industrial engineers. In the past, it was necessary for the average plant engineer to review four or five trade magazines to keep posted on new developments in his field; whereas in your magazine, PLANT ENGINEERING, you have most successfully been able to include the items of primary importance in one volume.

As a suggestion concerning the composition of the magazine, I believe that an occasional issue devoted primarily to one subject is quite beneficial. However, I think the pattern which you established on the first issues of your magazine is very well done and will be of most benefit to the average plant engineer.

The value of your magazine is hard to estimate, but I can say that it is one of our most valuable pieces of literature.

R. F. McCaw, Manager, Plant Engineering Dept., Radio Corporation of America, Engineering Products Department.

● ● ●

YOUR LAST three issues were most interesting to me. In my twenty-five years of experience as a Plant Engineer, I have never found a magazine that fit so well to my job. In reading the articles, I know they have been written by someone who has been "through the mill." Your February issue had so many good articles that I would not attempt to say which were best.

Your editorial "Plant Engineering as a Profession" was exceedingly interesting. It makes the Plant Engineer feel that his job is important after all. We hear too little about this branch of Engineering and your magazine is doing a wonderful job for the Plant Engineer.

In conclusion, I want to compliment you on this magazine, and I have no suggestions for improvement. I only ask that you continue your good work and I am sure you will have the thanks of all Plant Engineers.

S. A. Simonson, Plant Engineer, The Chicago Hardware Foundry Co.

● ● ●

THIS issue is very beneficial to plant engineering personnel due to its practical approach to the various subjects covered. Believe it is smart to keep each article concise and to the point so that it can be read in one sitting.

The importance of the issue cannot be underestimated. Material Handling is growing in value throughout the industry and more and more attention is being focused on this item.

J. McDonald, Plant Layout, General Foreman, Frigidaire Division, General Motors Corp.

● ● ●

LET ME congratulate you on the excellent section you published about Materials Handling in your January issue. It is one of the best we have seen. I like this section idea because it treats a problem as a whole and stimulates thinking about the complete problem.

We gave your section considerable study in our Plant Layout Department. If there is a shortcoming, it is the lack of emphasis of Plant Layout in relation to Materials Handling. Obviously a complete study of layout should coincide with a plant-wide study of materials handling. Three dimensional models are very helpful in analyzing materials handling problems. Combine this with Flow Process charts, as written by Mr. Maynard, and you have an unbeatable combination for analysis.

J. R. Clemens, Works Engineer, Link-Belt Co.

● ● ●

I PARTICULARLY like your placing the "Table of Contents" on the front cover, as it is very disconcerting to have to hunt through many pages of advertisements to find what is in a magazine.

Articles like "Industrial Lighting Installation," page 36, showing complete information are very good. Maintenance and operating costs of industrial trucks would have been an interesting addition to your material handling section. The cards you enclosed for obtaining additional information are very convenient.

G. R. Kilbourn, Plant Engineer, Marion Power Shovel Co.

● ● ●

THE JANUARY 1949 issue of PLANT ENGINEERING has the finest comprehensive articles on Materials Handling ever assembled in any one publication. Your entry into the field of Materials Handling has disclosed a thoroughness of research which is unique in this field.

To the Materials Handling engineer that must remain at his desk or in his own plant, your publication provides a wealth of otherwise unobtainable information. The time has arrived when Materials Handling must leave the realm of "trial and error" and enter into the more realistic field of "engineered" materials handling.

F. P. Frontiera, Materials Handling Engineer, Chevrolet Division of GMC.

● ● ●

FOR THE last several months, we have been laying the groundwork for a project of studying our operations with an eye to cutting manufacturing costs and thereby be in a better position to compete for business. In the last seven years there was little thought given to economy, however, the market has changed considerably in the last six months and now we are all more cost-minded. Your articles show the basic principles which we must follow to achieve better methods and lower handling costs.

G. E. Doherty, Plant Engineer, Gunite Foundries Corp.

● ● ●

COVERAGE of the Material Handling problem as given in the January issue of PLANT ENGINEERING magazine is a valuable contribution to every manufacturer faced with the problem of more efficient handling methods necessary to offset the rising costs of labor and materials and operate at a reasonable profit.

This material handling problem is of primary importance both to me and my company and being in a very competitive field of manufacturing it is imperative that the most efficient methods of material handling be employed. The articles on materials handling in the January issue are very important to me in my every day job as some of the articles coincide with my ideas and line of thought and others give me an entirely new slant on the problem whereby I might improve the materials handling methods in the plant where I am employed.

G. D. Ransdell, Chief Plant Layout and Equipment Designer, International Harvester Company, Farm Tractor Div.

● ● ●

PLANT ENGINEERING crosses my desk each month. It has always proven to be an interesting and desirable publication and is one which I and my associates look forward to receiving each month.

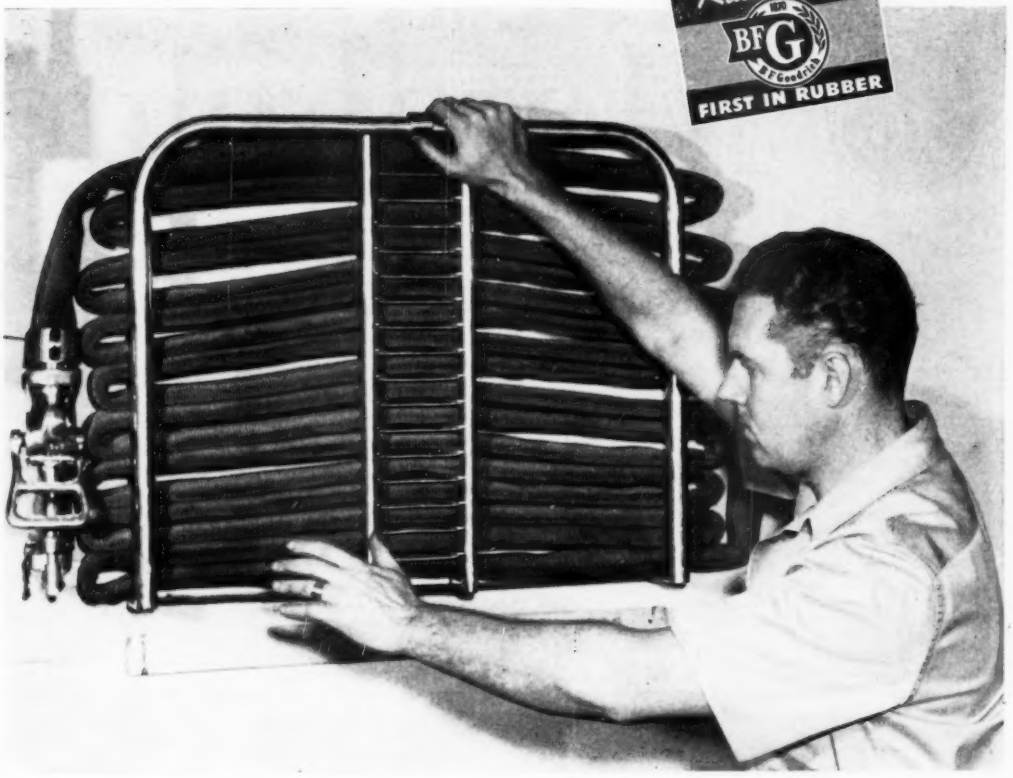
The special carried in the January issue was of particular interest in that it fully covered the materials handling problem complete in one issue. The writer feels that it is far better to present a subject complete in this manner so

(Continued on page 8)

MH Reprints Available

A limited number of reprints of the Materials Handling Section from the January issue of PLANT ENGINEERING are available and will be sent, one copy to a reader, on a first-come, first-served basis. Address your request to The Editor, PLANT ENGINEERING, 53 W. Jackson Blvd., Chicago 4, Ill., or mark "MH Reprint," on the postpaid card elsewhere in the issue, and drop it in the mailbox.

Plant Engineering is published monthly at 53 W. Jackson Blvd., Chicago 4, Ill. Subscription price $10.00 per year to U. S. A. $11.00 to Canada. $12.00 to other countries. Single copy $1.00. Application is pending for acceptance under Act of June 5, 1934.



The only industrial fire hose with all this extra protection

B.F.Goodrich improvements add years of hose life

B.F.GOODRICH industrial fire hose gives you all these improvements — strong end protection, flat cure, Agerite compound, Hydroseal jacket treatment, and Koroseal swivel gaskets. Here's how each of them helps fire hose give more years of safe service:

End protection — Most fire hose tubes crack in use at or near the coupling. In B.F.Goodrich fire hose this critical area is reinforced with a network of hard twisted cotton cords for 10 inches back from the hose end. This exclusive and patented BFG feature practically eliminates tube cracking near the coupling.

Flat-cured hose that stays "live" — Mill and plant hose spends most of its life coiled or folded on the rack. In round-cured hose this causes strain that cracks the tube. B.F.Goodrich-developed flat-cure permits the hose to coil or fold without kinking stress or undue wear. Another BFG development, the anti-oxidant Agerite—adds up to 250% to the life of the tube by keeping the rubber live.

Hydroseal jacket treatment — B.F.Goodrich Hydroseal treatment resists moisture, freezing, and mildew. Not just a surface application—Hydroseal penetrates every strand in the jacket, prepares the hose jacket for all sorts of weather.

Koroseal swivel gaskets—You can make a fast, positive, leak-proof seal by hand with Koroseal swivel gaskets — no spanner needed on most fire hose couplings. They last longer, too, prevent locking or freezing gaskets. With all BFG fire hose at no extra cost — look for this *red* gasket!

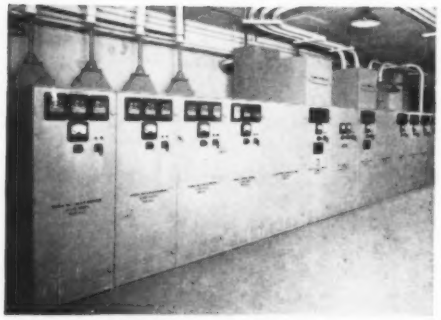
A hose for every need—B.F.Goodrich makes industrial fire hose for every service condition in every plant with some or all the above features. Your BFG distributor will gladly advise you on the best hose for adequate protection of your property. *The B.F.Goodrich Company, Industrial Products Division, Akron, Ohio.*

Koroseal—Trade Mark, Reg. U. S. Pat. Off.

B.F.Goodrich
RUBBER FOR INDUSTRY

The Philadelphia Inquirer – *chooses*

Metal-clad and load-center



Metal-clad switchgear handles incoming power at 13.2 kv, distributes it to four load centers. Breaker line-up (left to right): 4 feeder breakers, metering compartment, incoming line breaker, tie breaker, incoming line breaker, metering compartment, 4 feeder breakers. Metal-clad switchgear is neat in appearance, saving in space. Note absence of any protective railing or fences around unit—metal-clad construction offers operating safety to personnel.

Combination 3000-kva double-ended load center and electronic press drive control unit located on balcony. Windows on left overlook rotogravure press floor.

Two G-E 1000-kva double-ended load centers in basement of "Inquirer" Rotogravure Building. One unit is for lighting circuits, other for general power use. Transformers are modern dry-type, rated 500 kva. In right background is 13.2 kv metal-clad switchgear.

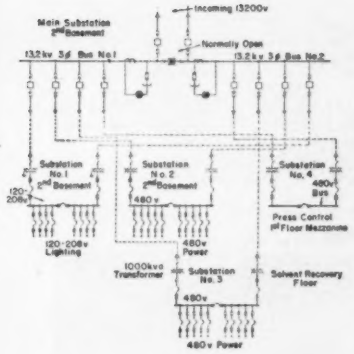
Double-ended dry-type load-center unit substation rated 2000 kva in solvent recovery room on top floor of "Inquirer" Rotogravure Building. Air circuit breakers are G-E Type AL-2-50 of 50,000 ampere interrupting rating. Horizontal grilles on transformer accentuate low, flowing lines of unit.

The "Inquirer" installation is a complete General Electric project—one source of responsibility, plus the very best in planning, engineering, manufacturing, and servicing facilities to give maximum savings and efficiency to the customer.

Switchgear unit substations

for proved service reliability!

"Metal-clad switchgear and load-center power distribution was the most efficient way to get continuous, reliable power for our printing operations."
C. W. GINSBERG, Chief Production Engineer, Philadelphia "Inquirer"



At the new Philadelphia "Inquirer" installation General Electric metal-clad switchgear handles the incoming 13.2 kv through 11 power breakers (2 incoming, 1 tie, 8 feeder) of 150,000 kva interrupting rating. Eight feeders distribute the power to four G-E double-ended, dry-type load-center unit substations throughout the building where the 13.2 kv is stepped down to 480 volts for utilization—right at the center of the load area. Drawout air circuit breakers are used on all unit substations. Note that costly secondary feeders are short.

This secondary selective system assures the "Inquirer" of continuous power at only slightly higher cost than a simple radial system.

Be sure to see the "More Power to America" full-color sound slidefilm "Modern Industrial Power Distribution." Ask your G-E sales representative to arrange a showing for your organization.

FOR CONTINUOUS-PROCESS OPERATIONS, **such as high-speed printing, you need continuous power. And with a General Electric load-center power distribution system like the "Inquirer" installation you get continuous power.**

Modern industrial power distribution systems using G-E switchgear and load-center unit substations are applicable to any industrial plant or commercial building where you want full-voltage conditions for top performance of equipment, an extremely flexible setup to take care of expanding or changing loads, adequate short circuit protection, safety to personnel, and low installation and maintenance costs. A complete system, using G-E switchgear and load centers, generally costs you less than a "piece-meal," makeshift affair.

"METAL-CLAD" **means just that—the entire switchgear structure is metal enclosed, thus offering operating safety to personnel. Note that there are no self-indicting protective fences or railings around metal-clad switchgear.**

The General Electric power circuit breakers, designed with adequate "IC" (Interrupting Capacity) for short circuit protection, are easily removable for inspection. This means less bother because when a breaker is temporarily out of service another can be quickly put in its place. Instruments and relays in the equipment are coordinated for positive protection of high-voltage feeders. And metal-clad switchgear is easy to install. It arrives factory-assembled—ready for final connection to power circuits.

UNIT SUBSTATIONS, **compact, fully-enclosed for safety, and built from matched components, are the basic "building blocks" of the load-center system. Flexible combinations of incoming-line and secondary-circuit arrangements from 100 to 2000 kva are available. Each is a complete unit with either dry-type or Pyranol* transformers plus G-E Type AK-1 or AL-2 air circuit breakers of the drawout type. Load centers are as easy to specify as a standard machine tool.**

Investigate today the many advantages of using G-E switchgear and load-center unit substations in your plant for efficient, flexible power distribution. Contact your G-E sales representative for further information—and write for the helpful bulletins listed below. Apparatus Department, General Electric Co., Schenectady 5, New York.

GEA-3083 Metal-clad Switchgear
GEA-4966 Low-voltage Metal-enclosed Switchgear
GEA-3592 Load-center Unit Substations
GEA-3758 What Load-center Power Distribution Can Do for You
GEA-4507 Interlocked-armor Cable for Primary Circuits
GEA-4352 Flamenol* Cable for Secondary Circuits

**Reg. U.S. Pat. Off.*

GENERAL ELECTRIC

From Our Readers

(Continued from page 4)

that the entire subject may be fully covered and none of the subject matter lost by failure to read or go over this matter in subsequent issues, and too, when presented in the form of a special section the whole thing can be thoroughly gone over while it is still fresh and of interest to the reader.

A number of other articles appeared in this issue which were of interest to the writer; namely, that on metallizing, industrial lighting installation and the article on low freight rate for pallets.

The magazine as published pretty well covers the writer's idea of the ideal magazine on plant engineering. We would find of particular interest articles on different types of factory flooring and their maintenance. This is a problem with us and is a problem with almost all plant engineers in large plants where there is considerable movement on floors.

F. Leopold, Chief Engineer, Lee Rubber & Tire Corp.

● ● ●

PLANT ENGINEERING is the most helpful of several magazines I read for my particular job.

Your articles on materials handling are of great value to me as I have been doing considerable work on this subject recently. I would also like to see you devote one of your issues to building construction for industrial buildings.

John M. Scudder, Jr., Asst. Plant Engineer, U. S. Pipe & Foundry Company.

● ● ●

PLANT ENGINEERS receive and try to read more magazines than any other group. Short articles are very well read. Keep the magazine small. Thick magazines are not read as extensively as thin ones. Personally, I skip all the ads when I'm looking through a thick magazine.

Maurice F. Degley, Plant Engineer, Ferro Machine & Foundry Co., Inc.

● ● ●

I HAVE found PLANT ENGINEERING to be a very interesting magazine. Each month I look forward to its arrival and always seem to find at least one article of particular interest. In the January issue the article on mechanical handling is particularly interesting because mechanical handling is one of the main expenses in most plants.

C. M. Baker, Plant Engineer, Ingersoll Steel Div. of Borg-Warner Corp.

● ● ●

PLANT ENGINEERING is doing a good job and I look forward to it each issue. A very practical approach.

Walter Baumgart, Plant Layout Engineer, Bell Aircraft Co.

● ● ●

THE LIFE of a good technical magazine is greater than one month, and informative issues like the January issue of PLANT ENGINEERING helps develop a good engineering reference library.

A. J. Van Vleet, Plant Engineer, Niagara Chemical Division.

● ● ●

I HAVE felt since this publication came out that this magazine fills a general industrial plant engineering publication better than any magazine on the market. We are always interested in the shop kink section which is always right down to earth. My electrical department has also been following electrical articles so that you can see this one magazine has something of interest to all sections of a maintenance department. We have been referring all advertising survey data to your magazine for good coverage.

Jerry Larkin, Chief Engineer, LaCrosse Rubber Mill Co.

● ● ●

I BELIEVE I have received copies of PLANT ENGINEERING from the original publication, and it is gratifying to notice the steady improvement, and the continuing enlarged scope of usefulness to the plant engineer, in fact, anyone else engaged in industrial management.

Today I had occasion to get price and specifications on a Moyno Pump. I picked up your magazine, and there was the advertisement on page 19. Just what I needed! Everything considered, the articles in the publication are interesting, and quite well diversified.

W. J. N.

● ● ●

I ENJOY looking through your magazine picking out articles of special interest to certain people in our organization and referring same to them. Your articles are more down-to-earth and factual than any other magazine. We appreciate checking our practice of maintenance methods with others described in your articles.

W. A.

● ● ●

PERSONALLY I like the type of articles you are now writing. There is a variety. Steam, air, electricity, etc., are all covered. The subject matter is well handled offering genuine reader interest. The magazine is routed to all of our maintenance foremen and their comments are favorable.

R. W. C.

PLANT ENGINEERING is tops with me and my staff. Your special articles are valuable to us and you have an excellent magazine.

M. B. F.

● ● ●

MY PERSONAL opinion of your January issue's Special Section is that of approval and appreciation, especially for the article by John F. Roberts. My hardest job is to sell top management on proven ideas that require additional investment.

W. H. G.

● ● ●

I HAVE always felt this magazine gives me more real information that concerns my every day job than any other.

J. W. Nelson, Chief Engineer.

● ● ●

I LIKE YOUR magazine because it keeps me abreast of those other plant engineering items which I must, of necessity, slight because of my specialty.

John G. Anderson, Materials Handling Engineer.

● ● ●

I BELIEVE your publication has filled a long felt need in the field of Plant Engineering and Maintenance. Your subjects are timely ones and information is well presented in text, photographs, charts and graphs. Of particular interest was the recent article by Mr. Whitehurst of Stone and Webster on Depreciation and Obsolescence of Handling Equipment and will be of use in one of our forthcoming projects.

J. Z.

● ● ●

ALL OF THE Divisions of General Motors are very conscious of the material handling problems to the extent that, as you may know, there is a central committee covering just this field. At one of our recent meetings, the articles listed in your January issue were discussed and it was the consensus of opinion that they were valuable information.

H. P. H.

● ● ●

I HAVE contacted a number of our staff of plant engineers and we are all of the same opinion that the regular department should be continued or even enlarged. We do, however, enjoy the special items and profit by them when they apply to our problems. I personally use the New Products and Methods Section considerably. Maintenance and Operation sheets also become quite dog-eared before we are through with the month's issue.

C. T.

On "Rats", and 1080

Contributed by H. C. Koehler
Monsanto Chemical Co.

THE COPY of your March issue of Plant Engineering containing the article on the control of rats was passed on to me by Mr. Gardner and I appreciated the opportunity of going over the article.

It is a fine, concise and inclusive article which will undoubtedly be appreciated by many plant operators. There is only one criticism, if you want to call it a criticism, which I would care to offer.

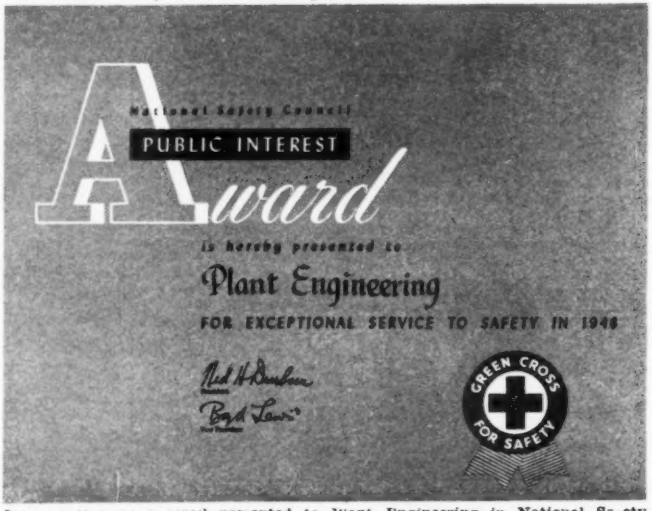
The story on 1080 is not complete without a statement as to the policy we follow in making sales. Because of its very poisonous nature, the lack of any antidote, and, in fact, the lack of any analytical procedure to determine its presence in human bodies, or animal bodies, Compound 1080 must be restricted very rigidly.

We have permitted no reselling arrangements whatever. We sell only to the consumer. Sales are restricted to governmental agencies and with the exception of the Federal agencies, we require some type of agreement showing that the recipient is qualified and takes responsibility for proper use.

The civilian exterminator, or pest control operator, must provide us with a signed agreement, similar to those enclosed, and also with a certificate of public liability insurance with the policy limits set at $50,000/$100,000.

Our prime interest is to serve the communities which require effective rat control, but also to protect the public. We are not out after big sales if they involve any hazard whatever.

We Thank You, National Safety Council



Reproduction of a scroll presented to Plant Engineering in National Safety Council's non-competitive award program. Plant Engineering was one of eight business publications so honored

TERM OF ACTIVITY FOR THESE TROUBLEMAKERS HAS

Expired

... YOU CAN SAY EXACTLY THAT WHEN YOU INSTALL THE . . . .

CASH STANDARD Streamlined PRESSURE REDUCING VALVE TYPE 1000

THESE ARE THE BENEFITS YOU GET

1. **Maximum capacity when needed most.**
2. **Accurate pressure control under toughest working conditions.**
3. **Trouble-free service.**
4. **Smooth operation.**
5. **Tight closure.**
6. **Speedier production results.**
7. **Elimination of failures.**
8. **Cost-saving operation.**
9. **No spoilage.**
10. **Practically zero in maintenance.**

USERS TELL THE BENEFITS . . .

"Our CASH STANDARD '1000' valve is used on a steam motor car to reduce the boiler pressure from 800 psi to 100 psi for the operation of a turbo generator for driving the fuel oil burner and blower. It operates by means of a pressure operated relay valve when the vehicle is not running, every time that the fire under the boiler goes on and also floats a storage battery on the line. I like the CASH STANDARD '1000' reducing valve because it is SIMPLE IN CONSTRUCTION, LIGHT IN WEIGHT, AND REQUIRES PRACTICALLY NO MAINTENANCE."

—from an engineer

"The CASH STANDARD '1000' Valves that we have in this plant are proving most SATISFACTORY IN ALL RESPECTS."

—from a manufacturer

"Most of our Type '1000' Valves have been in service for about 4 years and HAVE NOT REQUIRED ANY ATTENTION in that time except to adjust for different pressure requirements."

—from a manufacturer

"The CASH STANDARD '1000' Valves that we have in use have given us ABSOLUTELY NO TROUBLE and are preferred by our engineers to anything else on the market."

—from a vice president

"The ELIMINATION OF STEAM LEAKS and LOW MAINTENANCE COST have been especially gratifying. The LOW INITIAL COST, LOW MAINTENANCE, and TROUBLE FREE OPERATION results in the MOST ECONOMICAL PRESSURE REDUCING VALVE we have been able to purchase."

—from an instrument engineer

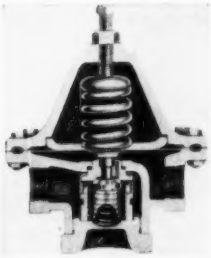
WRITE FOR BULLETIN 962

CASH STANDARD CONTROLS.. VALVES

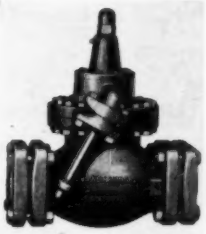
A. W. CASH COMPANY
DECATUR, ILLINOIS

BULLETINS AVAILABLE ON OTHER CASH STANDARD VALVES

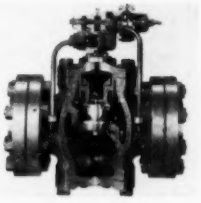
Send for them



Bulletin 950—features the CASH STANDARD Type D Single Seat Pressure Reducing and Regulating Valves for use with most fluids. Shows simple inner working parts that save in maintenance. Diagram explains how valve works. Blueprint shows simplicity of installation.



Bulletin 956—features the CASH STANDARD Type 4030 Back Pressure Valve — designed to automatically maintain a constant pressure in the evaporator corresponding to a constant temperature desired. Shows an Ammonia and Freon Gas Capacity Chart based on ABSOLUTE pressures.



Bulletin 966—features the CASH STANDARD Self-Contained, Pilot Operated Type 10 Pressure Reducing and Regulating Valve for use with water or air; with any gas or oil that is non-corrosive; and with refrigerating fluids such as Ammonia and Freon. Many interesting particulars explained such as: how valve works, tight seating, large capacity, no waste, no water hammer or chatter.

Plant Engineer's Digest

Tension on Trolley Conveyor Chain

TROUBLE IS sometimes experienced in determining the proper amount of tension required for an overhead trolley conveyor chain with a screw type take-up. Whenever possible, the take-up on an overhead conveyor should be located as closely to the drive as practical in order that the slack chain from the drive feeds directly to the take-up. If this is done, a minimum of tension will be required; that is, just enough to leave a little slack between the drive and the take-up to allow free articulation of the drive sprocket.

A better arrangement, when it is possible, is to provide a slight dip between the drive and take-up so that the slack chain runs into the take-up by gravity. When an automatic, counterweighted type of take-up is used, just enough counterweight should be provided to pull the slack away from the drive without adding undue tension to the chain. *From News-veyor, a publication of Mechanical Handling Systems, Inc., 4600 Nancy Avenue, Detroit 12, Michigan.*

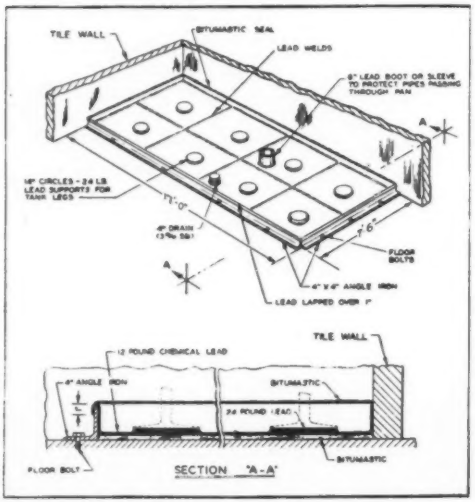
Lead Protects Concrete from Acid Attack

IN THE PLANT of the Heyden Chemical Corp. sulphuric acid must be kept available for use in various processes. The acid is diluted and stored at room temperature in two 650 gal glass-lined tanks from where it is conducted through pipe lines to reaction vessels. Leaks that developed in the conveying lines and fittings permitted sulphuric acid to drip onto the concrete floor supporting the heavy acid-filled vessels.

Despite frequent repairs and attempts at neutralizing the acid attack, the concrete continued to deteriorate and weaken. A simple method of protecting the floor was adopted. The engineers decided to take advantage of the sulphuric-acid-resistance of lead and they installed underneath the two acid tanks and their fittings, a shallow rectangular lead pan to retain any dripping acid, keeping it away from the concrete.

The large lead pan, under the acid tank, as shown in the illustration, consists of four sections of 12 lb chemical lead burned together to form a continuous sheet 7½ ft wide and 17 ft long. All the seams are lapped 2 in. A bitumastic layer protects the pan from direct contact with the concrete flooring. To make the 4 in. high retaining walls, separate sections of 12 lb lead were burned on, then turned up and lapped over the upper edge of the 4 in. angle frame in front and on one side. In back and on the other side, the edges are turned up against the walls.

As an added protection against vibration, the heavy tanks are supported on eight circles of 24 lb lead, 14 in. in diameter. The pan is graded to a drain where any acid leaking from the fittings can be washed away. For added rigidity the floor is constructed of 4 in. pipe made of 3 per cent antimonial lead. Pipe lines passing through the pan and concrete floor are guarded against splashing and overflowing liquids by a ½ in. soft lead boot or sleeve, 6 in. high and 6 in. inside diameter extending up from the base of the pan. *From Volume 17, Number 3, Issue of "Lead," a publication of Lead Industries Association, 420 Lexington Avenue, New York 17, N. Y.*



A lead pan such as this has proved an effective protection against the attack of sulphuric acid in the plant of Heyden Chemical Corp. Neutralization of the acid was found to be unsuccessful

Soap and Dermatitis

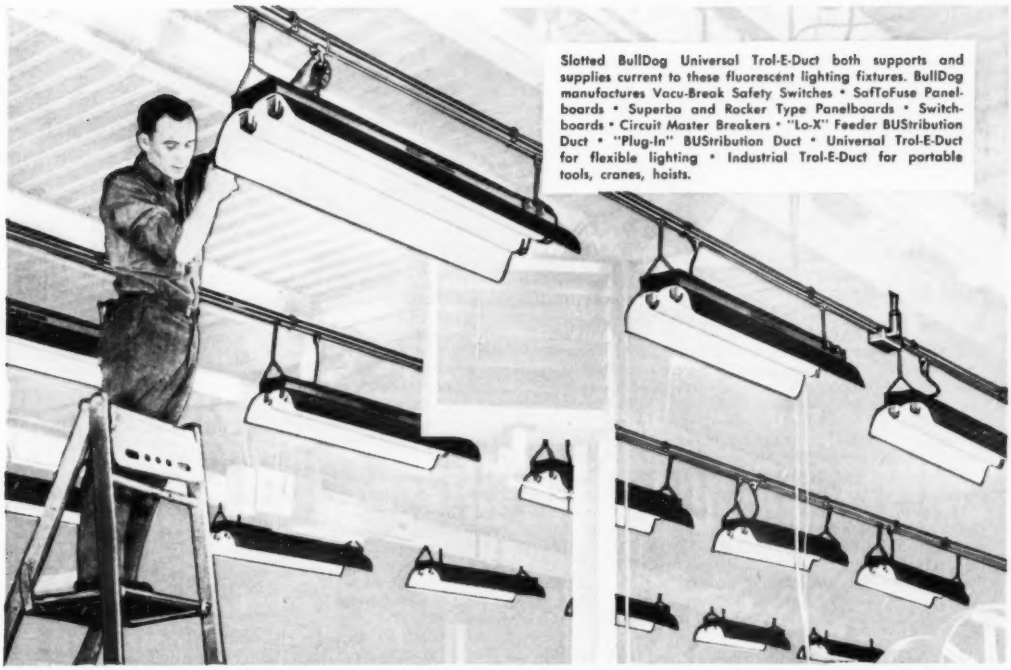
THE IMPORTANCE of soap in causing and preventing dermatitis is extremely important. The choice of cleansers is almost limitless. You can run the gamut from finely pulverized abrasives that remove all the dirt (and the skin, too) to soft, soothing compounds that can't possibly harm the hands and, furthermore, have little effect on the dirt.

Strongly caustic or highly abrasive cleansers simply irritate and chap hands, opening up new cracks and scratches where infection can take hold. On the other hand, a cleanser which is too mild just doesn't remove the various substances that lead to infection.

A cleanser that is going to do a real job in dermatitis prevention must meet more than one qualification. It must be able to remove all grease and oil that injures the skin by blocking the pores; it must be able to remove various solvents and chemicals that draw out natural skin oils; it must contain no strong alkalies that take water out of the skin; it must contain no harsh abrasives that will irritate the skin and cause minute cracks and scratches; it must get into existing skin openings and go after any infection that it present.

One such product, a powdered hand cleanser, contains seven different ingredients each with a specific job to do in accomplishing the above objectives. The saponification of the vegetable oil ingredients in the cleanser and the action of the blown bead soap base dissolve and flush away certain of the more common materials found on workers' hands. A scrubber ingredient of dehydrated and degerminated corn meal cut to certain exact specifications gets into every skin crevice and works the more adhesive material loose without in any way abrading or irritating the skin. Betonite, a third ingredient, provides another type of follow-up cleansing action and helps to soothe the skin. Lanolin and glycerin restore the natural skin oils and prevent drying out and chapping.

(Continued on page 12)



Slotted BullDog Universal Trol-E-Duct both supports and supplies current to these fluorescent lighting fixtures. BullDog manufactures Vacu-Break Safety Switches • SafToFuse Panelboards • Superba and Rocker Type Panelboards • Switchboards • Circuit Master Breakers • "Lo-X" Feeder BUStribution Duct • "Plug-In" BUStribution Duct • Universal Trol-E-Duct for flexible lighting • Industrial Trol-E-Duct for portable tools, cranes, hoists.

Spot your lighting with a slot

TIRED of rewiring the whole plant every time you move or add a lighting fixture?

Let the continuous outlet *slot* of BullDog Universal Trol-E-Duct spot your lighting fixtures where you want them.

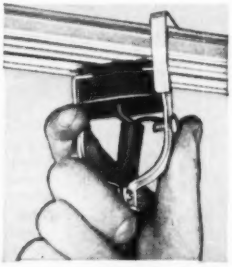
Universal Trol-E-Duct gives truly *flexible* lighting. Trol-E-Duct's slot makes it possible to add, remove or change lighting fixtures at will . . . without rewiring.

Twist-out plugs or trolleys tap current from the slotted opening which runs the full length of the Trol-E-Duct. They can be quickly attached or removed without disconnecting the current.

Prefabricated and standardized, Universal Trol-E-Duct is made in lengths from one to ten feet. It can be dismantled and reinstalled at any time, without scrapping a single part. Systems can be easily expanded by adding standard sections and fittings. Capacity: 50 Amps., 250 Volts, Single Phase.

Call in your BullDog Field Engineer for more information on this modern lighting system. He will be glad to show you a typical installation nearby.

For a mobile light source, use a trolley outlet. Easily inserted at a Trolley Entrance Coupling. Metal wheels roll smoothly astride duct slot. Contacts are in constant touch with bus bars as trolley moves.



Inserting a twist-out plug in Universal Trol-E-Duct is easy! Simply insert plug contacts in slotted opening of duct and give plug a quarter-turn. "L" supports lock plug firmly in place.

BullDog Field Engineers welcome the opportunity to sit in with you during the early planning stages of a building project. Their knowledge of electrical distribution layout can mean savings in installation costs, as well as efficiency and reliability in actual operation. Why not take advantage of this service?

BULLDOG ELECTRIC PRODUCTS COMPANY

DETROIT 32, MICHIGAN • FIELD OFFICES IN ALL PRINCIPAL CITIES

IN CANADA: BULLDOG ELECTRIC PRODUCTS OF CANADA, LTD., TORONTO

BULLDOG

HEADQUARTERS FOR ELECTRICAL DISTRIBUTION

(Continued from page 10)

Two other ingredients perform a definite counter-dermatitis action. They function as "healers" and go after any infection that may exist. The product, therefore, has a dual function of preventing the major cause of dermatitis by providing a complete, non-irritating cleansing action and stopping infection that has already developed. *By L. E. Hicks from the November issue of Safety Engineering, a publication of Alfred M. Best Company, Inc.*

Paint That Goes Around Corners

NEW ELECTRONIC devices that paint cars automatically and even make the paint go around corners to coat the backside of parts, are being adopted in a growing number of automotive plants. Automatic paint spraying equipment now is used in a number of plants for car roofs, hoods and other parts.

The paint spray gun moves up and down and sideways, under control of a battery of electric eyes. Depth of the paint is regulated by electronic devices. To make paint travel around corners and reach hidden surfaces an "electrostatic" painting process is used.

The car parts, which are to be painted, are passed through an electric grid which is given a high-voltage negative charge.

Paint sprayed into the space between the car parts and the grid also is given a negative charge which makes the grid repel the paint and causes the car part to attract the paint. The system permits automatic control of the depth of the paint.

Another electrostatic process removes the last drops of excess paint which drain and collect at the bottom of the sprayed item. *February issue of Automobile Facts, a publication of Automobile Manufacturers Association, 320 New Center Building, Detroit 2, Michigan.*

Floor Drains for Low Temperature Rooms

EVEN THE insignificant floor drain commands its full measure of attention in construction plans and specifications for low temperature rooms. Properly installed, the floor drain can be forgotten forever. Lack of adequate forethought, on the other hand, runs up construction costs and is bound to spell out trouble for the future operation of the room.

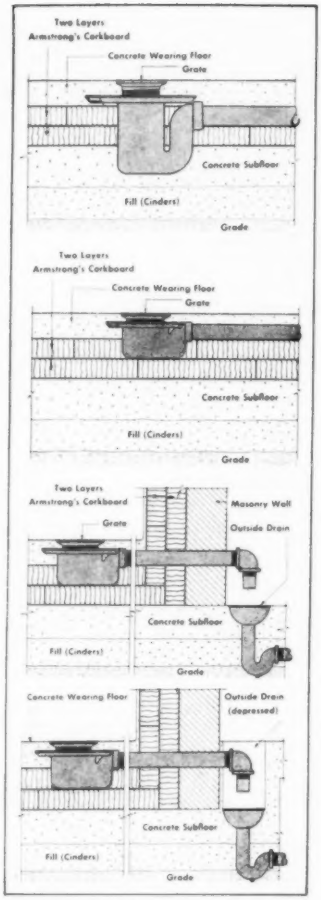
The accompanying drawings pretty well point out the basic principles to be observed in selection of proper floor drains and their installation. Select a floor drain which is especially designed for cold storage room installation. The significant design feature of these special drains is their short, squat dimensions.

The vertical space between the outlet and the base of a cold storage room drain is very much shortened compared to a common drain fixture. This means that the trap can be placed on top of at least some thickness of floor insulation in any refrigerated room. And thus, the drain and its lead-off piping can be installed without puncturing the insulating envelope at any point on the floor.

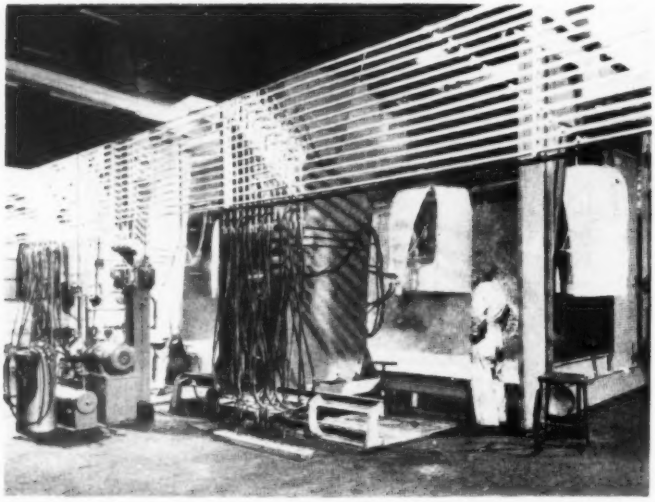
Drains should also have a screw thread collar, so the floor plate can be raised or lowered to accommodate varying thicknesses of wearing floor.

Before the last layer of insulation is applied to the floor, the drain and piping are installed. With the plumbing in place, the last layer of insulation is brought up to a snug fit underneath the pipeline running across the floor from the drain. After the insulation is fitted around the drain and sealed in place with asphalt, the concrete wearing floor is poured flush with the grating of the drain.

Drains for freezer rooms are installed in the same manner as cooler room drains, but they require more care. After a freezer has been cleaned and scrubbed down with water, glycerin should be poured into the drain to clear the trap of water before the room is put under refrigeration again. And, of course, this glycerin must be replaced after every subsequent cleaning of the room. *From the February issue of Armstrong's Insulator, a publication of the Armstrong Cork Company, Lancaster, Pa.*



Comparison of high floor drain fixture and cold storage room drains. Tall drain makes necessary piercing of insulation envelope



The pipes in the upper part of the photograph carry a variety of colors. Operation shown is car hood painting

Interlocking cranes move pipe over large dock area.
AMERICAN MONORAIL SAVES

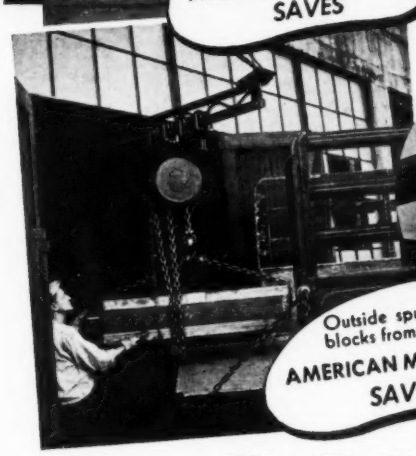
Crane on swinging jibs loads parts from fabrication.
AMERICAN MONORAIL SAVES

To Reduce Cost of

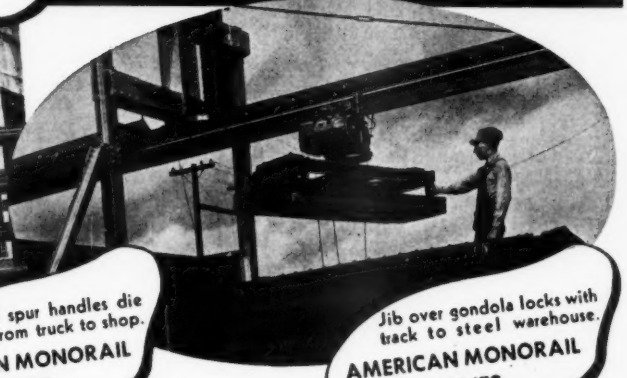
SHIPPING and RECEIVING *Steel*

Use AMERICAN MONORAIL Overhead Handling Systems

Spur track from crane unloads coil to storage yard.
AMERICAN MONORAIL SAVES



Outside spur handles die blocks from truck to shop.
AMERICAN MONORAIL SAVES



Jib over gondola locks with track to steel warehouse.
AMERICAN MONORAIL SAVES

THE AMERICAN MONORAIL COMPANY

13123 ATHENS AVENUE — CLEVELAND 7, OHIO

New Products and Methods

WHAT'S NEW? On these pages the Editors summarize the outstanding industrial developments of leading manufactcrers who will supply you, free of charge, the bulletins or other information desired. For ease in making requests use the no-obligation, postage-paid card between pages 18-19 and 50-51

1—CORK FILLED TAPE

Is easily wound on cold water pipes to stop condensation drip

The improved cork-filled NoDrip Tape is said to be more pliable than formerly, and much easier to put on cold water pipes. Sections of shop and factory floors, classed as dead space because of constant condensation drip from overhead water pipes, can be turned into storage space or work rooms by winding this tape around the pipes, it is claimed.

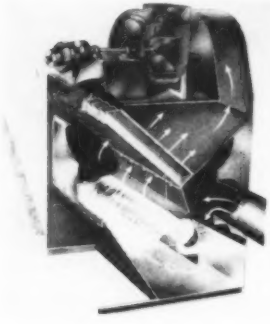
NoDrip Tape is clean and relatively inexpensive, since there are no high labor costs for application. Straight pipes, valves,

joints and tees can be covered by anyone in a few minutes without use of tools, adhesives or brads. Before applying, pipes are wiped dry and then NoDrip Tape is wound spirally around them to form a tight-fitting, sealed jacket. NoDrip Tape is brown, but can be painted any color with cold water paint. Enough to cover about 10 ft. of ½ in. pipe comes in the standard $1.69 package. J. W. Mortell Co.

2—DUST PRECIPITATOR

Hydrostatic type, re-designed for wider use, more efficiency

The Type N Roto-Clone is used for collection and control of dust generated in manufacturing and process operations. A hydostatic precipitator, it cleans the air by combined action of centrifugal force and inter-mixing of water and dust-laden air, re-using the water without recirculation pumps or spray nozzles. The new Design



2 Type Roto-Clone, with capacities thru 48,000 cfm maintains a lower pressure drop with the same cleaning efficiency and water recirculation rate and can be operated from 50 to 120 per cent of its nominal rating without affecting its collecting efficiency according to manufacturer. All sizes are available in either manual clean-out, sludge ejector or hopper bottom arrangement. American Air Filter Co., Inc.

3—WHITE PAINT

Is specially made for heavy-duty industrial application

Stonhard Millwite is described as a specially created and prepared paint for varied industrial use. It is a heavy, white semi-paste, said to be economical and easily applied by brush or spray and claimed resistant to mildew, moisture, dirt and chemical fumes. Its extreme whiteness is credited to the fact that it's a titanium dioxide paint, said to have exceptional hiding and coverage qualities. It can be applied to wood, concrete, plaster, wallpaper or other interior wall or ceiling surface. Tints may be added as desired. Stonhard Co.

4—WELD-TIME METER

For measuring the duration of welding current

According to manufacturer, four factors must be controlled in making a resistance weld properly: electrode contour, current delivered to weld, electrode pressure and duration of welding current. The weld-time meter furnishes an accurate measure of the duration time of the weld and is used to check the schedule set by the welding control. This unit has the following advantages: It is portable and can

be carried in one hand. It is a direct reading instrument which totals weld time and gives values in seconds and cycles. It has a calibrating device built-in so it can be built directly on to welding machine or control. It is said to be insensitive to heat control. Westinghouse Electric Corp.

5—TROLLEY BUSWAY

Offers 2, 3, or 4 pole construction in single housing

The new LTG Flex-a-Power plug-in or trolley busway is designed to provide both trolley power take-off and a continuous outlet for fluorescent lights and small power tools. It's said to be the only one of its type in 2, 3 or 4 pole construction with one compact housing.

Manufacturer says new simplified hanging and joining methods speed up installation 30 per cent and make it one of the easiest busways to install. Rated 50 amps —250 v, a-c or d-c—has two or more circuits that can be run in one housing and still be controlled separately. This advantage was intended to save space and provide a more compact arrangement. Plugs or trolleys are polarized so that loads may be balanced conveniently on both sides of the busway. Built in standard fittings such as elbows and radius sections. The Trumbull Electric Mfg. Co.

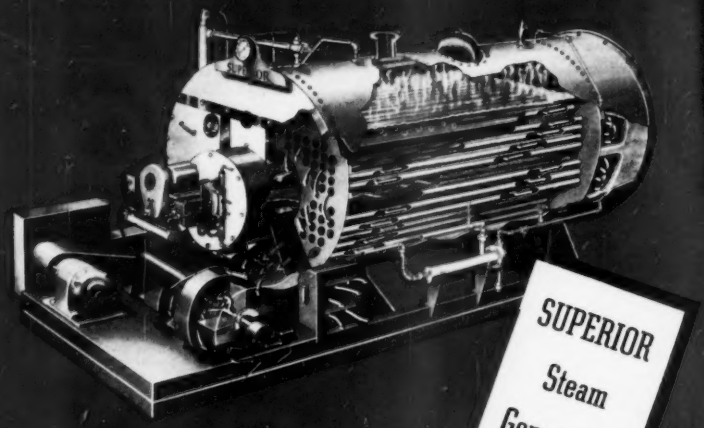
6—AUTOMATIC AIR VALVES

For hot water heating, they help prevent fuel waste

According to the manufacturer, the new automatic hot water air valve, called Taco-Vent, requires no adjustment and no manual venting; it conserves fuel by keeping radiator rid of air and filled with hot water. Its operation is described thus: Air passes through its special filter, por-

ous bronze plug, fiber discs and vent holes to atmosphere; water following the air is cleaned of foreign matter and "slowed up" as it passes through bronze plug. When water reaches the fiber disc it causes it to swell, thus sealing the valve. As more air accumulates the disc dries and shrinks, permitting valve to vent again. This valve is recommended for use on radiators, radiant baseboards, convectors and high points. Taco Heaters, Inc.

YOU CAN SEE THE DIFFERENCE



Write for Catalog No. 108

Superior Combustion Industries, inc.

Factory: Emmaus, Pa.
Executive Offices: Times Tower, Times Square, New York 18, N. Y.

New Products and Methods

7—POWER SUPPLY UNIT

For applications requiring variable voltage at low current

This new wide range power supply apparatus features a continuously variable voltage output from 500 to 50,000 v with maximum current output of 1 ma. High voltage is attained through radio frequency oscillator, power amplifier, RF transformer and ladder-type voltage tripler circuit.

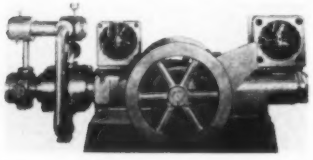
Switch on control panel provides for selection of two ranges: 500 to 5000 v and 5000 to 50,000 v. Gravity-operated grounding device shorts output terminals when high voltage is turned off. Controls are provided to turn supply on or off and adjust voltage and plate current in oscillator tubes.

Power requirements are 100-130 v rms, 60 cycles, with commercial stability. Full load consumption is approximately 1000 w. Ripple is between 0.006 and 0.04 per cent. Drift is less than 20 ppm per minute on low voltage range and less than 100 ppm per minute on high range. Special Products Div., General Electric Co.

8—TWO STAGE COMPRESSOR

For gas or air; it's engine driven, direct connected

Designed to compress large volumes of gas or air, this compressor, Model O-1OTS consists of a low and a high-stage compressor cylinder driven by a multi-fuel engine. Has Bosch fuel pump for operation on Diesel oil, or with Ensign carburetor and Bosch magneto for operation on natural gas or butane. Manufacturer says engine conversion can be done in about 90 min.



Compressor cylinders, with circulating-water cooling system, have top suction and bottom discharge for gas condensates. Engine power cylinder is cooled by circulating water or by condenser-type system using belt-driven fan. Large capacity oil reservoir provides adequate lubrication. Optional equipment: air starting valves or gasoline-driven friction starter, flywheel guards, steel base. Domestic shipping wt. 8000 lb; export shipping wt. 9250 lb. Length 149 in., height 62 in. width 39 in.; boxed for export 212 cu ft. White-Roth Machine Corp.

9—WELDING CURTAINS

Confine rays from welding operation to a given area

These welding curtains are designed to protect other workers and the passer-by from rays given off by the welding operation. They are constructed of standard 10 oz U.S. Army duck, treated for fire resistance. Curtains have eyelets across the top spaced approximately 10 in. apart, and 2 eyelets in each lower corner. They may be suspended on a horizontal rod or pipe support by hooks or cord lace; bottom eyelets allow for rope attachment to pull curtain taut. This provides easy means of pulling curtain out of the way. A. Smith & Sons.

10—BALANCING WAY

Simplifies and speeds static balancing without centering

This new balancing way is said to provide a quick and accurate means of statically balancing all types of rotating equipment. Units have hardened discs ground on the OD and mounted on precise ball bearings for maximum sensitivity and long life. The bearings are lubricated and sealed when unit is assembled and no further maintenance is required, it is said. May be set up on floor or on a bench and they are ready for use, no levelling is necessary. Revolving discs are mounted on solid end castings which are movable on two shafts to accommodate different sizes of work. Can be disassembled for carrying. In four sizes based on the size of work they will accommodate: 10, 20, 42 and 60 in. swing. Crown Industrial Products Co.

11—BLUEPRINT CABINET

Is strongly built; has many filing applications

Solidly built of heavy gage furniture steel this cabinet has smooth gliding drawers on ball-bearing rollers, and is equipped with a lift compressor in the front of the drawer and a hood in the rear to prevent filed material from curling, creasing or tearing. Comes in olive green or gray crinkle finish. The five drawer units can be securely stacked to meet individual requirements. An automatic plunger-type lock controlling all five drawers and a 7½ in. high base are available. Two sizes: one with inside drawer dimensions, 37 in. wide, 25 in. deep and 2¼ in. high; and one with drawers 43 in. wide, 32 in. deep and 2¼ in. high. Cole Steel Equipment Co., Inc.

12—SURFACE TROFFER

Is made with easily-used hinged enclosing glass

The new Guth G-S-T, glass surface troffer has a hinged enclosing glass; no springs, screws or latches. Its side-of-channel starters are easily reached and changed. Glass is a curved panel of ribbed Albalite. Surface troffer is finished in white Permalux with end ornaments. The Edwin F. Guth Co.

13—VENTURI TUBES

Small size, for use where line fluid velocities are high

These fabricated venturi tube assemblies are available for line sizes between ¾ in. and 3 in. They're supplied with welding ends, with stub end welding nipples for measurement connections. Can be furnished in steel, stainless steel, Monel, brass, bronze or any other metal obtained in tubular and bar forms which can be readily welded or brazed.

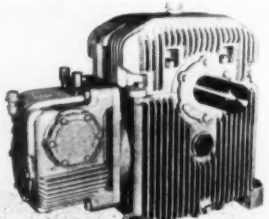
These tubes are said to be particularly useful where line fluid velocities are so high that excessive differential range is required, with an orifice plate, or where solids in suspension in the line fluid tend to deposit in the space immediately ahead of or after an orifice, or on the orifice plate itself. Republic Flow Meters Co.

14—REDUCTION UNITS

Double type, afford many combinations as to capacity, ratio

By using standard speed reducers as primaries and secondaries, a new line of double reduction units comprising over 86,000 combinations as to capacity, model and ratio are made available. This provides models with input ratings of from ½ to 68 hp, from 4,000 to 244,000 in.-lb output torque, and reduction ratios of from 25-to-1 to 4900-to-1. Only major difference between standard reducers used in the double reduction units and those supplied for single reduction is that primary gear shafts and secondary pinion shafts are shorter. Adapter plate and flexible coupling connects the two reducers. Special housing is used for smallest of primary reducers. Otherwise, all parts are standard.

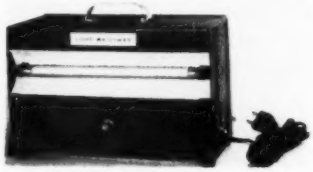
Individual reducers are interchangeable and separately replaceable within given size ranges, and may be dismounted and converted to single reduction units. Standard gear sets also make it simple to change ratio of any combination. There are 5 sizes of primary reducers and 8 sizes of secondaries. Features include high speed metallic oil seals where seal is immersed in oil; provision for water cooling; oversize anti-friction bearings. Cone Drive Div., Michigan Tool Co.



15—EMERGENCY LIGHT

Starts when regular source of current is interrupted

The "Light Watchman" is a new safety device designed to provide instant, automatic light when the regular source of current is interrupted; when current is restored the emergency light goes off automatically. The soft, glareless fluorescent light is said to provide approximately 10

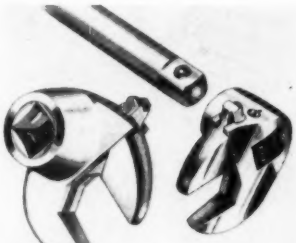


hr emergency service with standard dry cell batteries. Uses standard fluorescent lamp. No special wiring needed. Plugs into any 115 v a-c outlet. Has convenient carrying handle and can be used as a hand light. Weighs only 9½ lb. Size: 9½ in. long, 6 in. high, 4½ in. deep. Price $29.95, including batteries and fluorescent tube. Chatham Products Co.

16—CROWFOOT WRENCH

Adjustable, for use with different handles and parts

Manufacturer says these attachments combine, through the medium of one tool, the flexibility of the detachable socket system with the advantages of the open-end adjustable wrench. When used with numerous handles and parts available, they present a variety of new combinations useful to machinists and mechanics. They will perform nut turning operations formerly not thought possible. Attachments are made from alloy steel in two square drive sizes, ⅜ and ½ in. with capacities of ¾ and 15/16 in. Square shoulders on body portion of sliding jaw are claimed to provide maximum and positive bearing against working stress. J. H. Williams & Co.



17—DRUM HANDLER

Lifts and transports drums, barrels and containers

An improved 3-wheeled carrier, the Drumobile, is designed to lift, transport and release any size or type of steel drum, wood barrel or cylindrical fibre container. Model 800 Series, now available, is made for loads up to 850 lb in 50 to 60 gal sizes. Claimed unique among carrying vehicles, the Drumobile picks up the container, carries it in a level, upright position and deposits it gently without being touched by hands and without tilting.

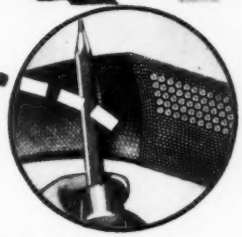
Scarcely wider than the drum itself, the Drumobile can be operated in close quarters. The 17½ in. lever-handle, after lifting load and actuating safety lock, becomes a vertically free-swinging steering column, adapting itself to desired height. Welded chassis is equipped with choice of 3 accessory gripping devices for drums, barrels or

Make this Test with ANY V-Belt

You'll See at Once Why the

CONCAVE SIDE---

(U.S. Patent No. 1813698)



Saves You Money!

Bend any V-Belt and feel the sides change shape. The top of the belt, under tension, *narrows*. The body, under compression, *widens*. The sides of the belt bulge out.

The result, if the belt is built with *straight sides*, is a shape that does not fit the sheave groove—as shown in Figures 1 and 1A, below.

Straight-Sided V-Belt

How Straight-Sided V-Belt Bulges in Sheave-Groove

Clearly, the bulging of the sides will produce excessive wear along the *middle* of the sidewall as indicated by arrows.

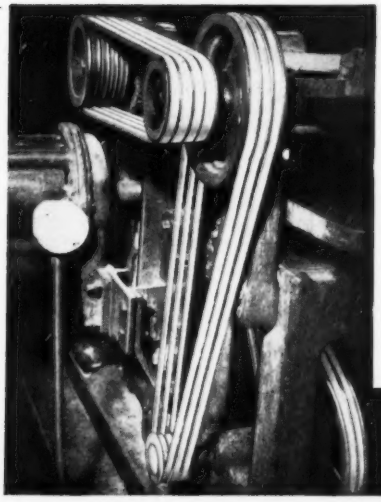
Now, bend a V-belt with the *concave* side—the Gates Vulco Rope.

You get the same shape change but *now* the new shape exactly fits the sheave groove—as shown in Figures 2 and 2A.

Gates Vulco Rope with Concave Side.

No Side Bulge. Precise Fit in Sheave-Groove.

Results? (1) *Uniform* sidewall wear; *longer life!* (2) Full sidewall grip on the pulley. Carries heavier loads and *sudden load increases* without slippage; saves *belts* and also saves *power!*



The Concave Side is *MORE IMPORTANT* NOW Than Ever Before

Because the *sides* of a V-Belt are what actually *drive* the pulley, it is clear that any increased load on the belt means a heavier load that must be transmitted to the pulley *directly* through the belt's sidewalls.

Now that Gates *SPECIALIZED* Research has made available to you SUPER Vulco Ropes—carrying fully 40% higher horsepower ratings—the life-prolonging Concave Side is naturally more important in conserving belt life today than ever before.

THE GATES RUBBER COMPANY
DENVER, U.S.A.
The World's Largest Makers of V-Belts

494

Gates
REG. U.S. PAT. OFF.
The Mark of SPECIALIZED Research

GATES VULCO ROPE DRIVES
Engineering Offices and Jobber Stocks IN ALL INDUSTRIAL CENTERS of the U.S. and 71 Foreign Countries

New Products and Methods

rimless fibre containers. Neither gripping mechanism or other part of vehicle will dent or puncture any container, according to manufacturer. The Drumobile is claimed

to have a long, service-free life. Prices range from $87.50 for steel drum model, $92.50 for wood barrel model, to $99.50 for combination drum and barrel model. Ernst Drumobile Div., Brantwood Products, Inc.

18—TRIANGULAR RETAINER

For developing tight assemblies on relatively soft shafts

A new self-locking device, Truarc Triangular Retainer, Type 5305, is claimed particularly useful in developing tight assemblies free from end-play on shafts of cold rolled steel, castings and plastic materials. The Truarc triangular "ring" has been designed as a low-cost retainer, requiring no groove or special tools for assembly.

Retainer has a flat or spherical cross-section and three equally spaced projecting prongs. It is easily positioned in the direction of installation; the prongs lock around the shaft. This retainer is said to resist considerable thrust loads, vibrations and impacts. Waldes Kohinoor, Inc.

19—METAL PRIMER

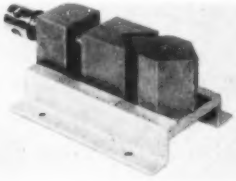
Is fast drying; can be re-coated within same day

According to manufacturer, Tremco Quick Drying Chromated Metal Primer is a priming treatment that makes it possible to apply two coats of paint over metal in a single day. The priming coat dries to touch in 10 min and may be handled in 20 min, it is said, and can be re-coated in 30 min to an hour, under average conditions of temperature and humidity, even with coatings containing strong solvents, without danger of primer's lifting or blistering. In cases where scaffolding or staging is required, the need of swinging a job twice is eliminated, it is claimed. The Tremco Mfg. Co.

20—BUS BAR BENDER

Is portable, can be used wherever needed in plant

The new Flexo Bus Bar Bender is claimed remarkable for its flexibility which makes it readily adaptable to use in the shop or field. Measuring only $18\frac{1}{2}$ in. overall, it can easily be stowed in the maintenance



truck, while its weight of 110 lb makes it possible to use it wherever needed. Manufacturer says it has ample capacity to bend bus bar up to 4 in. wide and $\frac{1}{4}$ in. thick to a clean 90 deg angle. Flexo Machines Co.

21—TORQUE BAR

Is lightweight, easily handled; built for heavy duty

Extreme accuracy and ruggedness are claimed for the new Livermont Torq-Bar. Bar is pre-set for specific torque requirements within its range; when desired torque is reached a loud "click" is heard and simultaneously a small button in the handle taps the operator's hand. Thus both sound and touch signals are given. Standard model has 200 to 600 ft-lb range; special models can be made in ranges up to 5000 ft-lb. Price complete is $75.00, bar alone costs $65.00. Either right or left hand ratchets and torques. Maintenance is said to be unnecessary because mechanism is sealed in lubricant. Richmont, Inc.

22—CONVEYOR SWITCHES

Have adjustable angle; for use with wheels or rollers

The "Flexa-Curve," an adjustable angle conveyor switch, can be set at any angle from through travel to 45 deg right or left; the "Flexa-Y" can be set for travel that far in either direction.

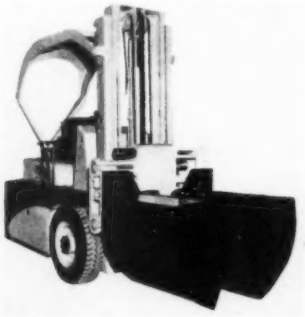
On these switches each movable axle of rollers or wheels is mounted in its individual frame which slides on a strong steel bed. A flexible center rib is provided to keep them concentric at any setting, and a lever underneath curve bed shifts the rolls as a unit from one position to another and the locking pins maintain such setting.

Because rollers are concentric, the work accepts the change in direction of flow naturally and doesn't require guard rails, according to manufacturer. Metzgar Co.

23—CLAMSHELL BUCKET

For use with lift truck in handling bulk materials

A clamshell bucket of 7/16 cu yd capacity is available for use with the Hyster "40" (4000 lb capacity) lift truck. The unit mounts on the sliding supports of the basic Load-Grab as optional equipment.



Operated by a lever at the driver's right, the clamshell opens and closes by means of the same hydraulic power which spreads and contracts the arms of the standard Load-Grab (palletless material handling attachment). This new tool is designed for handling such bulk materials as sand, grain, chemicals and insulating materials. A standard lifting height of $8\frac{1}{4}$ ft (to the bottom of the closed bucket) makes it a valuable aid in loading and unloading trucks and railroad cars. Hyster Co.

24—FLOOR RESURFACER

For repairing breaks and cracks in concrete floors

Laboratory tests have shown that Armor Floor Resurfacer has great tensile strength and resistance against wear from steel traffic, according to manufacturer, who says it won't crack, crumble, "dust" or sand. Armor has also been tested for resistance to effects of water, greases, heat and many chemicals and is claimed to be high in both heat and moisture resistance. It's recommended for breweries, ice cream factories, dairies and garages, also adaptable for use in tool and die shops, machine shops, food processing plants, paper pulp mills and textile mills. Shipped as a dry powder, this floor resurfacer adheres to new and old concrete; 15 hr after application it will take light traffic and after 24 hr it's ready for heavy-duty trucking. Monroe Co., Inc.

25—REMOVABLE BODY

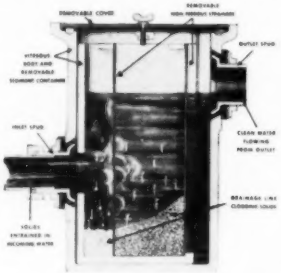
Increases efficiency of 2-wheeled hand trucks

According to manufacturer of the Re-Bo body, this low-cost unit solves a lot of handling problems—it speeds up service, maneuvers easily in narrow aisles and treats goods gently. It's made for use on any 2-wheeled truck, the lip of the truck slips under the Re-Bo. Made with reinforced steel frame and oak loading surfaces. Base is 29 x 25 in. and upright is 29 x 48 in. It weighs 70 lbs and has carrying capacity of 1200 lb. Price per unit is $9.90 for less than 10; $9.40 for any quantity from 10 to 99 and $8.90 for 100 or more. Re-Bo Mfg. Co., Inc.

26—SOLIDS INTERCEPTOR

For keeping waste water solids from entering drainage lines

This solids interceptor was engineered for intercepting and collecting bits of plaster, metal, glass and other solids that would enter and clog drainage lines. The unit has been designed to permit easy and quick cleaning. The impervious, non-



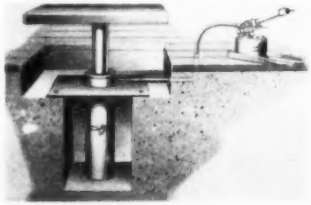
metallic cover is easily removed by unlocking a cover clamp, and the sediment container lifted out for cleaning. Two perforated metal strainers are provided to intercept solids in waste water as it passes through interceptor body.

The strainer nearest the inlet intercepts larger fragments; the second strainer completes interception of all solids passing through. In addition, they serve as baffles to quiet turbulence of the water, permitting solids to drop to bottom of sediment container where they are collected for removal. The inlet being located approximately 4 in. from bottom of interceptor, directs water upward to outlet near the top of the opposite side, leaving collected solids undisturbed. J. A. Zurn Mfg. Co.

27—ELEVATING PLATFORM

Is designed as "package unit" to simplify installation

Here's a flush-with-floor type hydraulic elevating platform designed as a "package" unit. The standard model is furnished with a 30 in. square top which elevates from floor level to 24 in. Manufacturer says that 2000-lb loads can be elevated with ease by means of the single speed hydraulic foot pump. Optional extras include elevation up to 36 in., larger platforms up to 36 x 36 in. and a power operated pump with either push button or foot switches. Lyon-Raymond Corp.



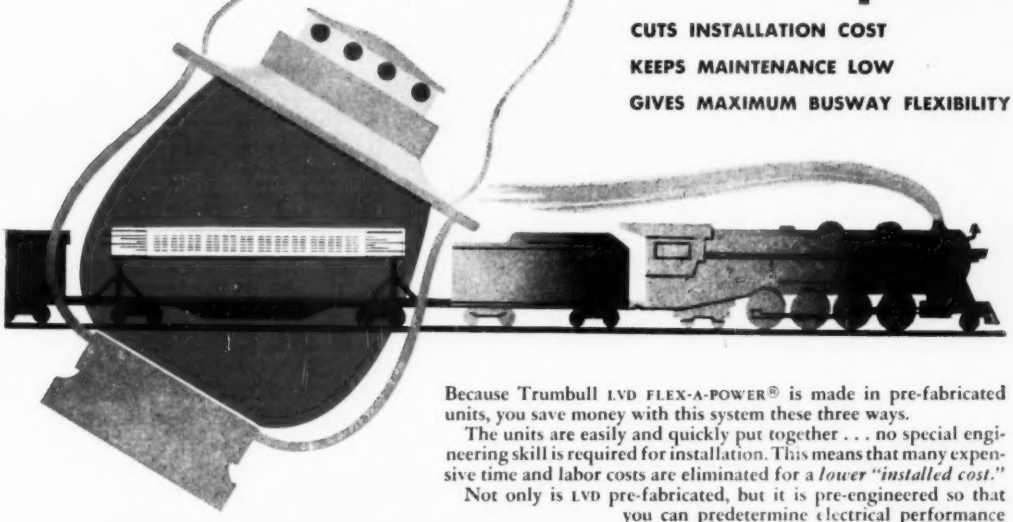
LVD Flex-a-power

STOP, LOOK AND READ HOW EASILY

CUTS INSTALLATION COST

KEEPS MAINTENANCE LOW

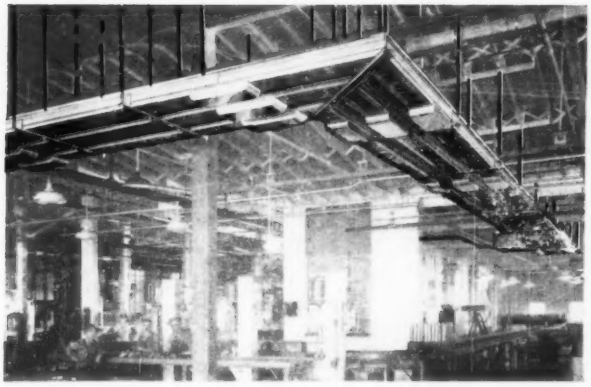
GIVES MAXIMUM BUSWAY FLEXIBILITY



Because Trumbull LVD FLEX-A-POWER® is made in pre-fabricated units, you save money with this system these three ways.

The units are easily and quickly put together . . . no special engineering skill is required for installation. This means that many expensive time and labor costs are eliminated for a *lower "installed cost."*

Not only is LVD pre-fabricated, but it is pre-engineered so that you can predetermine electrical performance before actual installation. This advantage is an important factor in minimizing voltage drop and in keeping machine efficiency high.



LONG-LIVED MATERIALS —

Another advantage — LVD FLEX-A-POWER materials do not deteriorate even under the most severe operating conditions, thus assuring years of satisfactory service *without costly maintenance repairs.*

ADAPTABLE, "TAKE-APARTABLE" —

LVD FLEX-A-POWER is readily adaptable to any power distribution problem you may have. Fast to install, its convenient "take-apart-ability" allows you to relocate your LVD system without replacing a single part!

Learn more about the many advantages of LVD. Write for Circular TEC 152 today. THE TRUMBULL ELECTRIC MANUFACTURING COMPANY, Plainville, Conn.

Men Who Observe the Best Electrical Practice Make It a Practice to Use

TRUMBULL (T) ELECTRIC

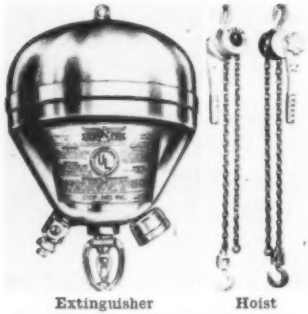
TRUMBULL'S TRAINLOAD OF NEW PRODUCTS

New Products and Methods

28—FIRE EXTINGUISHER

Automatic sprinkler type, it is portable, ready for use

This economical unit, constructed of heavy brass, silver welded, needs no piping or other installation. Simply hang it up, and it is ready to operate, utilizing the new fire extinguisher fluid known as C.B.M or Chlorobromomethane. Flame does not have to touch this unit. When fire occurs, heat waves cause sprinkler head, (like those on automatic water systems), to discharge under pressure a wide, fast-moving spray of combined carbon dioxide and atomized Chlorobromomethane. This quickly blankets and snuffs the fire, with no residue, stain or damage, according to manufacturer. Claimed equally efficient on oil, grease, flammable liquid, lacquer, paint, solvent, or electrical fires, it is non-freezing, and has minimum specification capacity of 700 cu ft. Carries Underwriters' Laboratories listing. Stop-Fire, Inc.



Extinguisher Hoist

29—LEVER OPERATED HOIST

For lifting and pulling; comes in one- and two-ton capacities

The new "Tugit" is operated by a lever. But instead of effecting hook movement by a rachet lever acting directly on a rachet wheel integral with the lifting sprocket or pocket wheel, the Tugit's lifting is done by a lever acting on the gear train exactly the same as in hand or electrically operated hoists. Between operating lever and lifting pocket wheel is a Weston type load brake. Due to location of brake, the load on the brake is less, and because of the gear train the hook may be moved a short distance.

The Tugit has anti-friction bearings and because of its construction greater loads may be lifted with less effort on part of operator, according to manufacturer. With a Tugit, it requires a pull of only 40 lb on the handle to lift a load of 2000 lb, it is said. Because operating handle is only 12 in. long the Tugit may be used in close quarters and stowed easily. The 1-t capacity unit weighs 14½ lb; the 2-t, 18¾ lb. Available this month. Shaw Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc.

30—SPEED CONTROL UNIT

For use on new and existing machinery prime movers

This new electronic automatic speed control unit is designed for increased production, closer quality control and lengthened machine life. Known as the Varitronic Drive, it can be installed on existing or new equipment and is described as a simplified system for utilizing recognized flexible performance characteristics of d-c motors, but operated from an a-c power source. It embraces either constant torque or horsepower, and control can be held within limits as close as 2 per cent of basic speed, according to manufacturer.

Use of this drive is said to facilitate flexible remote push button control, dynamic braking, automatic reversing, inching, jogging, controlled acceleration and deceleration and control of input torque or horsepower. Motor and brush life are said to be lengthened because drive is engineered for specific power range, and chance of overloading or damage by operator lessened. Electron Equipment Co. (Sales handled by Industrial Associates)

31—SUMP PUMP

Is capable of continuous, uninterrupted operation

A completely submergible sump pump, the P-109, is designed to pump a sump dry to eliminate stagnant, dirty water. The turn-on point, or height of water required to start this pump, is adjustable from a few inches to several feet without special tools.

The diaphragm switch has no moving parts exposed to water, and does not require a float. Pressure of rising water actuates switch which is located in discharge line, and subsequent pumping action keeps it in operation. Switch automatically shuts off when pump draws air. While all exposed surfaces are of durable bronze construction, this unit weighs only 45 lb and is only 9½ in. high and 11 in. in diameter. It's easily installed; requires no permanent mounting. Powered with a ⅓ hp 115 v a-c motor, the Kenco Sump Pump is rated at 3300 gal per hr at 10 ft and will pump water to a height of approximately 25 ft. Kenco, Inc.

32—ROLLER LIFTS

In two capacities; for handling crated or uncrated heavy loads

The manufacturer claims these new Roi-A-Lift models will handle extra heavy or bulky loads and move loads into tight places. The Model M-2 has a 2000-lb capacity and is designed for moving long counters, freezer units and storage bins. It is built with adjustable forks to accommodate crates of varying width and operates with mechanical cam lift. The other new model, the M-8, has an 8000-lb capacity, and is recommended for moving heavy, bulky, crated products and palleted units. Skarnes Engineering and Supply Co.

33—ZINC RODS

To inhibit corrosion in all types of industrial equipment

Cor-Ins are zinc rods designed to extend corrosion resistant life of water lines, tanks and heat exchangers where corrosive conditions do not seem severe. They are also said to be applicable where corrosion may be aggravated by hot or salt water, catalysts or electrolytic action. The zinc rod used in Cor-Ins has higher electro-chemical potential than metals to be protected from corrosion. Thus, oxygen or other corrosive agents consume the zinc in preference to the electro-chemically less active metals of which hydraulic equipment is made. Cor-Ins are tested for ideal reactivity ratio to insure their becoming more active when corrosive conditions are severe.

Cor-Ins are fitted with standard pipe-plug ends which screw easily into heat exchangers, piping and hydraulic equipment. Rods come in ⅜, ½, ⅝, ¾ and 1-in diameters with lengths up to 12 in. Roto Metals, Inc.

34—GLASS FABRIC

For waterproofing treatment and as lagging on pipe lines

Developed to provide a permanent type of reinforcing membrane fabric for water and corrosion proofing treatment, Glassfab is now being used as pipe lagging on interior, exterior and underground lines. Woven wholly from glass fibre, it is said to be strong and to resist wear and abrasion.

It's also pointed out that Glassfab won't rot, and won't char under high temperatures of hot bitumen. Has no capillary or "wicking" action; doesn't carry volatile oils up out of the mastic and doesn't conduct moisture into coating, according to manufacturer.

Among applications of Glassfab are use on refrigeration lines of air conditioning systems and on outside steam lines. Being an "open" mesh and easily impregnated, Glassfab may be used with any specification waterproofing mastic or compound for either hot or cold application. Comes in widths up to 36 in. Lexington Supply Co.

35—MAGNETIC PULLEYS

For extracting tramp metals before or during processing

Power-Plus "non-electric" permanent magnetic pulleys require no outside power source. They can be used as either head end or idler pulleys in belt conveyor systems. These pulleys come in 57 standard sizes, including diameters from 12 to 30 in., and belt widths from 4 to 60 in. They are crowned to prevent belt weaving and runout and to assist in equalizing conveyed material as it passes over pulley. Standard or special length shafts fit new or existing applications without changing bearings or shaft mounting. Head plates are cast aluminum. There's said to be no loss of magnetic flux to the shaft. According to manufacturer, pulleys are not affected by atmospheric or temperature changes and can be used indoors or outdoor. The Homer Mfg. Co., Inc.

36—D-C PNEUMATIC TIMER

For motor acceleration, machine sequences and resistance welds

This new d-c pneumatic timer (Class 9050) is similar in construction to manufacturer's a-c design and has same advantages. It is designed for accurate timing (less than —10 per cent variation for mean timing period) and to be unaffected by normal changes in voltage and ambient temperature.

Its timing period is adjustable from 0.2 sec to 3 min, and timing adjustment is operated by finger-tip setting of knob or micrometer dial. Snap action contacts—normally open and normally closed in self-contained, arc-resistant melamine case —are rated for a-c or d-c control circuits, and the electrical interlocks are actuated by the magnet which operates timing mechanism. Both d-c Type **Q** and a-c Type R timers are available for time delay after either de-energization of the magnet. Square D Co.

37—ROTARY MAGNET TOOL

Can be lowered into tanks for picking up steel parts

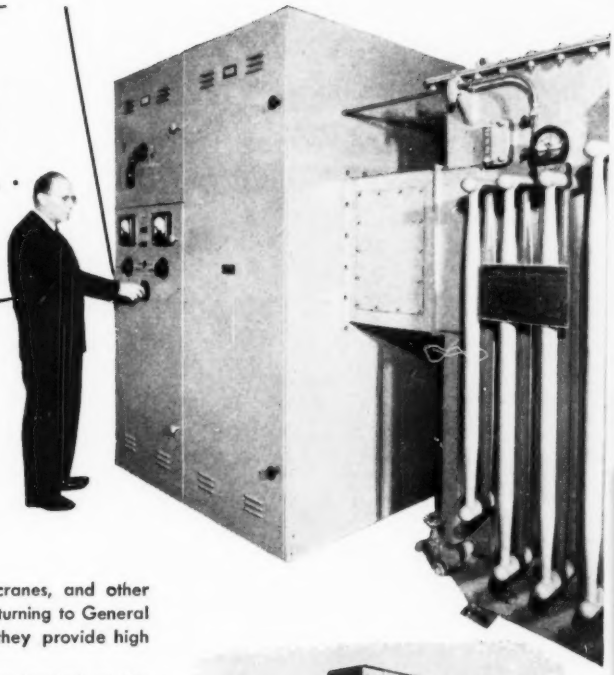
An improved model of the Multilift Rotary Tank Magnetool is described as having 50 per cent more magnetic power and design features which make it impossible for the tool to attach to the tank. No contact with parts is necessary, it is said, they jump from 1 to 2 in. to the magnetic tube. Tool is built to resist ordinary acid and alkali solutions, such as those used in plating and cleaning, and is self-draining. It is lowered into tanks and propelled like a carpet sweeper on its wheels, or moved up and down. Standard models with 15 and 19 in. overall width cost $29.00 and $36.00. Neither size is intended for lifting extremely heavy parts. Large units made to order. Multifinish Mfg. Co.

38—GLAZING COMPOUND

Is long lasting, easily applied to wood or metal sash

According to its manufacturer this glazing compound, called "33," is permanently elastic; it expands and contracts with temperature changes and doesn't harden, chip or loosen in service. It's easy to use and said to be extremely long lasting. Another advantage for "33" is that it stays smooth and pliable in the container and doesn't get lumpy even after the container has been opened. You don't have to use the entire contents of the container at one time. Comes in 1, 2, 5 and 10-lb containers and in larger drums. The Armstrong Co.

POWER COSTS . . .
down 33%
YEARLY REPAIR COSTS . . .
$2500 less



Universal Battery Co. uses General Electric rectifiers to get LOW-COST D-C POWER

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This 150-kw G-E ignitron rectifier, one of two located at the Universal Battery Co., Chicago, converts 220 volts a-c to 250 volts d-c for charging 2600 batteries daily. Mr. Emil Arnst, chief engineer, says that the rectifiers save more than $2500 yearly in repair costs, and cut power bills by one-third. In his opinion:

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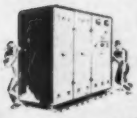
Find out how you can put d-c power into your plant at a saving. Call or write your nearest G-E sales office for information on a size to fit your needs. *Apparatus Dept., General Electric Company, Schenectady, New York.*



Low Cost Installation . . . because G-E Mercury-arc Rectifiers have no major rotating parts, they can be installed quickly and easily any place that is reasonably level and capable of supporting their weight.

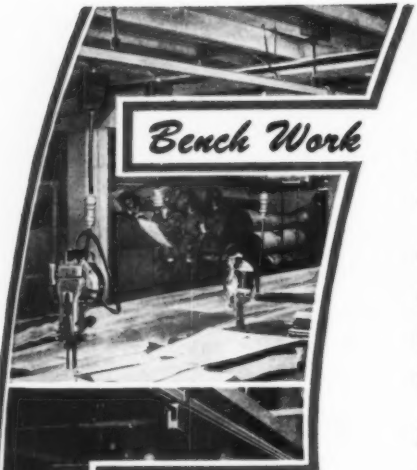
Low Cost Operation . . . because G-E Mercury-arc Rectifiers give you high efficiency over a wide load range, with low no-load losses, and at low cost maintenance, their operating costs are naturally low.

Low Cost Maintenance . . . because G-E Mercury-arc Rectifiers only require periodic inspection of the equipment, and because they can handle momentary overloads without increasing maintenance, the cost of upkeep is kept at a bare minimum.

G-E MERCURY-ARC RECTIFIERS MEAN LOW-COST D-C POWER

GENERAL ELECTRIC

WHAT—*no wires?*



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Photographs, Hyster Company

● **Elevators—Above: With commendable ingenuity combined with the uprights and working parts of a lift truck, the Spokane Safe and Lock Co., Spokane, Wash., has devised an unusual street elevator capable of lifting loads of 2,500 lb at a rate of 20 fpm to a height of 3 ft above the sidewalk. Power for the elevator is provided by a 2 hp electric motor with a 4 in. pulley on the motor and a 10 in. pulley on the pump. ● Right: On the other hand, the Moloney Electric Co., St. Louis, uses an electric hoist to operate an inexpensive freight elevator. The elevator lifts and lowers components to and from a mezzanine storage. It is constructed with sheet metal sides and bottom secured to channel-and-angle frames. It is guided by upright angles extending from the ceiling of the balcony to the ground floor. Lugs, welded to the elevator sides, keep it in correct vertical alignment. The electric hoist which does the work is permanently mounted to a building girder. The wire-rope hoist cable is threaded through pulleys to direct the vertical motion of the elevator. Upper and lower limit switches, supplied with the hoist, automatically stop the elevator at the exact floor and balcony levels without operator attention**

Photograph, Durisol, Inc.

● **Three-in-One—Use of a new, light-weight, reinforced roof plank, provides a building with fireproof roof decking, insulation and sound absorption. This particular job is being installed at Ensign Ribbon burners, Inc., Pelham Manor, N. Y.**

Photograph, The Yale & Towne Mfg. Co.

WHY REACTORS ARE USED IN INDUSTRIAL POWER SYSTEMS

By H. J. FINISON, Industrial Power Div., Industrial Eng. Divisions, General Electric Co., Schenectady, N. Y.

What reactors will do to limit short circuit currents and cut both investment and maintenance costs . . . General advantages and disadvantages . . . Where they can be used to advantage . . . Reactor in main circuit vs feeder circuits . . . Calculations for typical systems . . . Reactors for load center systems make possible coordinated ratings

REACTORS are frequently used in ac power systems to obtain improved performance or reduced costs. Some of the benefits provided are:

1. Reduce the maximum possible short-circuit current.

a. Reduce the required interrupting rating of circuit breakers. This means lower cost and less space.

b. Reduce the damage at the point of fault. This means less repair time and cost.

c. Limit the thermal and mechanical stress on all parts of the system through which short circuit current must flow. This may reduce required size or strength of system components, for example, permit use of smaller cable.[1]

2. Reduce the effect of a short circuit on the remainder of the power system by limiting the reduction in voltage during the short circuit.

As a general rule, power system engineers do not advocate the use of current-limiting reactors. The most frequently advance objections to their use are: 1. Kilowatt loss; 2. kilovar loss; 3. increased voltage regulation; and 4. reduced steady state stability. The latter objection is not often significant in industrial power systems since the reactance which can be tolerated is usually limited by permissible losses and voltage regulation.

There are times, however, when the use of reactors is warranted. Take, for instance, an industrial plant that has outgrown its system voltage but has too much capital invested in equipment to allow a change. Here, many sources may be tied together through a reactor synchronizing bus to good advantages. Use of reactors is also to be found in conjunction with breakers feeding small apparatus that does not have sufficient interrupting capacity for connection directly to the system.

Proper arrangement of reactors in a system can avoid or reduce some of the disadvantages while retaining their effectiveness in limiting short-circuit currents. Subdivision of circuits is an important means of accomplishing this objective.

Figure 1a shows a single reactor in a circuit supplying four feeder circuits. Fig. 1b shows an alternative arrangement with a reactor in each feeder circuit. Which is the better arrangement?

[1] See Short Time Cable Heating Limits During Faulty Current Flow by R. H. Kaufmann, *Power Generation*, Feb., 1949.

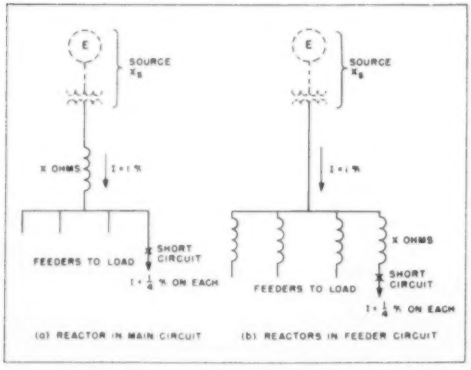


Fig. 1. Possible arrangements of reactors to limit short circuit current on feeders. Circuit breakers are omitted from the diagram for simplification (The symbol °/1 means per unit; 1 °/1 100 per cent)

Reactance Required. The desired reduction in short-circuit current will determine the required impedance for the reactor. In either Fig. 1a or 1b the current which will flow to a short circuit on a feeder is, neglecting resistance of the circuits,

$$I_{sc} = \frac{E}{X_s + X} \qquad \text{Eq. 1}$$

where: I_{sc} = Short circuit current: E = Voltage; X_s = Source reactance; and X = Reactor reactance. In this equation the quantities may be expressed in volts, and ohms or in terms of per cent or per unit amps. The latter is more customary for power system calculations.

For Figs. 1a and 1b the values for E and X_s will be the same. Thus the reactance X which must be added to limit the short-circuit current I_{sc} to the desired level is the same for either Fig. 1a or 1b.

Voltage Regulation. Under normal operating conditions, we are interested in the influence of the reactors on voltage regulation. Neglecting resistance

$$\Delta E = IX \qquad \text{Eq. 2}$$

where: ΔE = Voltage drop; I = Current; and X = Reactance. We have seen that the reactance X will be determined by short circuit considerations. But at least we have

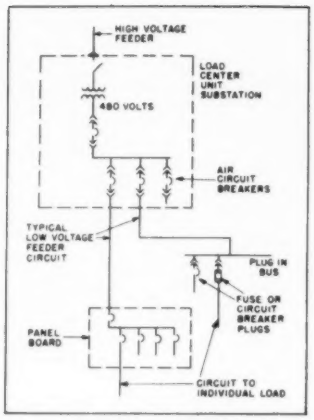


Fig. 2. Typical low voltage power supply in an industrial plant. A typical load center substation, panel board and plug-in-bus are shown by Figs. 3 to 5

Table I. Comparison of performance of reactors arranged as shown in Figs. 1a and 1b

ITEM	Fig. 1a In Main Circuits	Fig. 1b In Feeder Circuits
Voltage Drop $\Delta E = IX$	1	¼
Kilowatt Loss $W = I^2R$	1	1/16
Kilovar Loss $VAR = I^2X$	1	1/16

ΔE = voltage drop; I = current; X = reactance; R = resistance; W = power loss; VAR = reactive loss.

Fig. 3. Unit substation in penthouse over factory area. Note reactors above to hold short circuit to 15,000 amp.

Fig. 4. Typical industrial panel board installation showing one incoming feeder circuit and six outgoing circuits

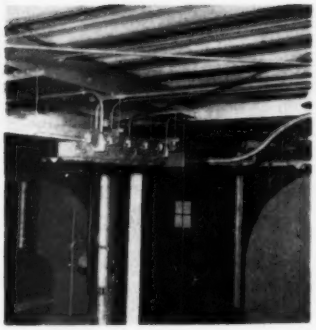


Fig. 5. Plug-in-bus on ceiling with incoming feeder, of interlocked armor cable, and several outgoing circuits

some control of voltage drop by selection of rated current. By keeping current small, we can obtain low voltage drop. We can keep rated current small, we can obtain low voltage drop. We can keep rated current small by proper subdivision.

If current through the feeder reactor in Fig. 1b is ¼ the current through the main circuit reactor in Fig. 1a, voltage drop will be ¼ as great in the subdivided circuit arrangement as for the single reactor arrangement. As shown by Table I, subdivision of the circuits also gives lower power (kilowatt) and reactive (kilovar) loss.

For the example we have just studied, we assumed that all of the current flowing to the short circuit was supplied from the power source. In the more typical case, some of the current may be contributed from induction or synchronous motors connected to the feeder circuits. This makes the feeder reactor arrangement even more advantageous.

Unit Substation. Figure 2 shows a typical arrangement of low voltage (600 v and below) power supply in an industrial plant using the load center principle. Low voltage feeders originate in the unit substation (Fig. 3) through circuit breakers and may supply panel-boards (Fig. 4) or plug-in-bus (Fig. 5). Circuit breakers or fuses in the panel-boards or in the plugs for the plug-in-bus connect to individual loads.

At the present time, protective devices for the panel-boards or plugs are available with interrupting ratings up to 25,000 amp, and, between 15,000 and 25,000 amp interrupting rating there is appreciable price difference. For example, a 125 amp circuit breaker in a panel-board has a price of about $255.00 for 25,000 amp and $110.00 for 15,000 amp. interrupting rating. Since there will be many of these protective devices in the usual plant, the use of 25,000 amp devices throughout may be very expensive.

Yet, it is common practice to use unit substations of 1000 kva or more from which the available short-circuit current exceeds even 25,000 amp. Hence, there is frequently need for use of current limiting reactors to reduce the available short-circuit current to the 15,000 or 25,000 amp. interrupting rating of the circuit breakers in the panel-boards or on the plug-in bus.

With a 1000-kva unit substation, the calculated available short-circuit current as shown by Fig. 6a is 30,400 amp. Fig. 6b shows the arrangement with a single reactor in the main circuit. Fig. 6c shows the individual feeder reactors. It is designed to limit the short-circuit current on the feeder circuits to 15,000 amp.

In Fig. 6b, the current contributed to the short circuit by the synchronous and induction motors does not flow through the reactor. Since a typical contribution from the motors would be about 6000 amp, only 9000

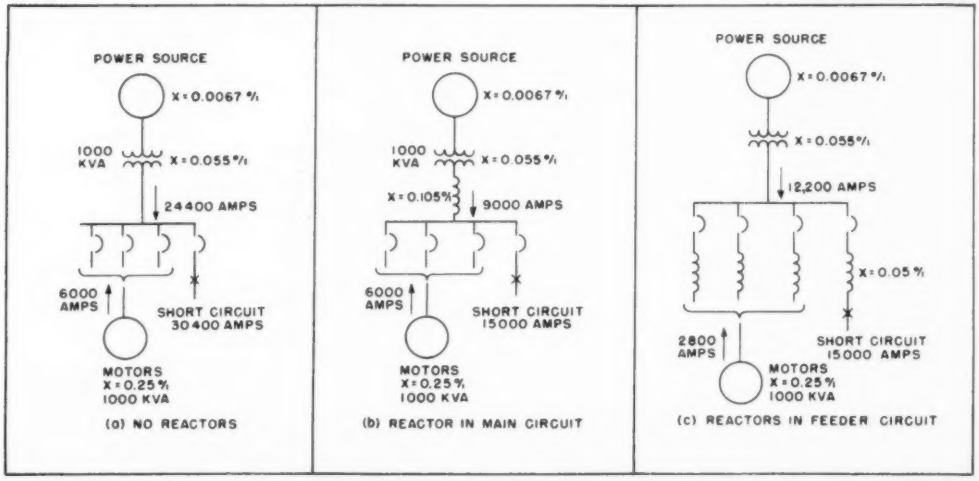


Fig. 6. Typical application of reactors on 1000-kva, 480 v unit substation to reduce fault current on feeder circuits to 15,000 amp. All reactance values are in per unit on a 1000-kva base. Primary fault current is assumed to be 150,000 kva

amp may be permitted from the supply transformer without exceeding the desired maximum of 15,000 amp. A reactor of 10.5 percent is required to limit the transformer contribution to 9000 amp.

In Fig. 6c, the current contributed to the feeder short circuit by both the transformer and motors must pass through the feeder reactor. Thus, a reactance of only 5 percent is required to limit the short circuit to 15,000 amp. This reactance is expressed using 1000-kva as a base as was used for the Fig. 6b example. Since usually the feeder circuit will have a normal rated capacity of 200 to 300 kva at 460 volts, the reactance expressed in terms of circuit kva is correspondingly less. Table II gives a comparison of voltage regulation for the three cases studied in Fig. 6.

The arrangement with the single reactor in the main incoming circuit gives excessive voltage regulation of 10.8 per cent and would not be considered as a satisfactory system. The individual feeder circuit reactors give better voltage regulation. The comparison shows that the subdivision of the circuits into circuits of lower normal rating gives the better votlage regulation.

Table II. Comparison of voltage regulation for system arrangements shown in Fig. 6. A power factor of 0.8 with full kva output from the transformer assumed

Fig.	Method	Total Percent Voltage Regulation*
6a	No Reactor	4.5
6b	Main circuit reactor	10.8
6c	Feeder reactors	
	225 amp	5.1
	600 amp	6.0

* Includes regulation in primary systems, transformer and reactor.

Table III. Reactor sizes and characteristics for limiting short circuit current

Continuous Circuit Rating	Short Circuits Between	Reactors Reduce Short to
	Short Circuit Ratings in Amp	
230v 225 amp	25,000—100,000	25,000
	15,000— 50,000	15,000
480v 225 amp	50,000—100,000	50,000
	25,000— 75,000	15,000
	15,000— 50,000	15,000
230v 600 amp	50,000—100,000	50,000
	25,000— 50,000	25,000
480v 600 amp	50,000—100,000	50,000
	25,000— 50,000	25,000

New Reactors for Load Center Systems. A new line of reactors for low voltage feeder circuits has been recently developed. These reactors are spiral-wound, air-core units. They are usually furnished as an integral part of the low voltage switchgear. They may also be supplied in conjunction with panelboards or plug-in-bus such as shown in Fig. 3. While the development of the full line has not yet been completed, it is contemplated that it will include the ratings shown by Table III. The development of these reactors makes possible the coordination of interrupting ratings of circuit protective devices for the entire industrial electric power system.

Controlling Deposits in Industrial Piping

By A. L. YOUNG, Master Mechanic, The Neville Co.
Neville Island, Pittsburgh, Pennsylvania

Organic and mineral deposits cut heat exchanger efficiency and clog piping system . . . Chlorine feed kills organic growths but forms mineral deposits . . . Supplementary treatment with glassy phosphates eliminates trouble . . . Details of system, equipment and dosage

IN OUR resinous products processes, as in many other processes, it is important that piping and heat exchangers carrying water as a coolant be kept free of organic and mineral deposits. The character of such deposits is dependent mainly upon the organic and mineral constituents of the water and the temperatures which it attains.

To kill and prevent organic growths in such industrial systems, chlorination is generally used. As for mineral deposits, our experience indicates that the addition of glassy phosphates such as Calgon or Micromet, effectively controls them. These mineral deposits may be calcium carbonate scale which commonly occurs when hard water is heated; or, iron or manganese oxide deposits which precipitate when well waters containing dissolved iron or manganese are aerated, or, when chlorine which acts as an oxidizing agent is added.

About 18 mo. ago, we found that too many shutdowns were being caused by inefficient heat transfer in condensers and other heat exchangers using well water as the cooling medium. Inspection of certain units revealed that the poor heat transfer was caused by an adherent slimy deposit on the water side. Consultation with water-treatment specialists established the fact that the deposits were organic growths predominantly of the slime type. Chlorination was recommended to control these growths.

A chlorinator of the automatic gas type was installed near the well as shown in Fig. 2. This chlorinator installation is typical of those in which a small volume of water (approximately 3 gpm) is bled from the well pump discharge to the chlorinator, where it picks up several hundred parts per million of chlorine as predetermined by a manual setting of the chlorine proportioner.

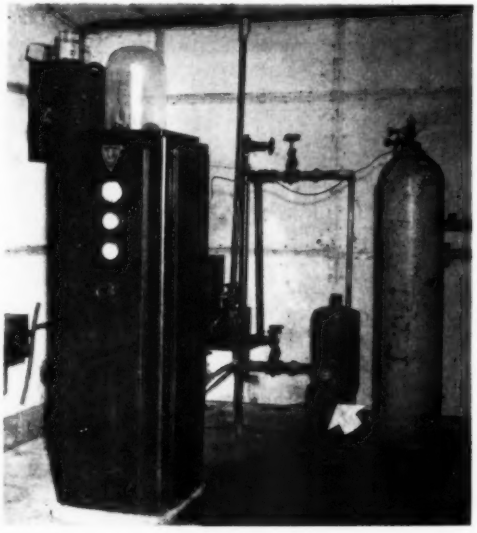


Fig. 1. Photograph of the chlorinator (left) and phosphate feeder (arrow) as installed at the Neville Co. plant

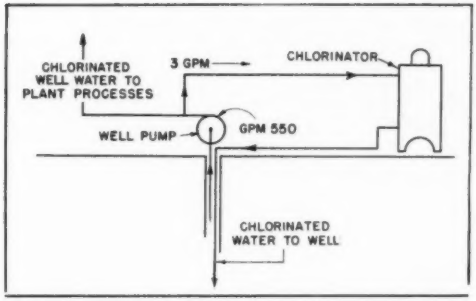


Fig. 2. Chlorinator hook up used to control organic growths by adding provide about 2 ppm residual chlorine in the plant cooling water. Magnesium oxide deposits caused difficulty

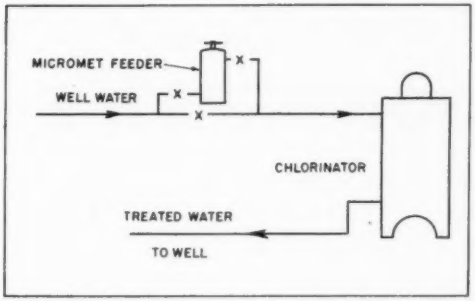


Fig. 3. This phosphate crystal feeder installed ahead of the chlorinator eliminated the black deposits. Details of the feeder are shown by Fig. 4, and a photograph by Fig. 1

This water, now containing a high concentration of chlorine, is returned to the well, near the pump suction, to provide a chlorine residual of about 2 ppm in the plant cooling water.

The chlorinator was put into service with the required chlorine feed set for continuous operation. Within 3 or 4 da., however, a distinct sluggishness developed in the chlorine injector. About the fourth day operation failed completely. An examination revealed heavy black deposits had formed on all parts where the well water and the chlorine were in contact.

Analysis of the black deposit showed it to be an oxide of manganese apparently formed as a result of the oxidizing effect of the high chlorine concentration added to the well water going through the chlorinator. This deposition proved troublesome. It was also costly in point of labor and time because, to keep the chlorinator functioning, it was necessary, to disassemble the mechanism every third or fourth day and remove the deposit. After reassembling, satisfactory feeding would continue for a few days.

Accordingly, steps were taken to find a solution. It was brought to our attention that similar difficulties with red iron oxide deposits in chlorinators is a common problem where the water contains dissolved iron. Since many chlorinators are being kept clean by the use of glassy phosphates introduced to the water entering the chlorinators, it was suggested that this treatment be applied to our unit for this treatment is reported to hold dissolved manganese in solution as well as dissolved iron.

An analysis of the well water was made to determine the amount of treatment necessary. The first analysis showed a dissolved manganese content of 9 ppm which is unusually high. It was estimated that 5 lb. of glassy phosphate material would be required per month. We learned this could be done by making a solution of Calgon and introducing it by means of a small proportioning pump. However, it was felt that considerable expense for feeding equipment and frequent attention would be required to introduce the small amount of chemical necessary on a continuing basis.

In view of this it was decided instead to use another glassy phosphate, Micromet, which is slowly soluble and therefore easy to apply to small water systems. Because it is slowly soluble it is virtually self-feeding. When placed in a pot-type feeder on a cold water line, it dissolves at a relatively constant rate of approximately 25 per cent of its weight per month which is not appreciably affected by the quantity of water flowing through it.

A simple pot-type feeder was installed on a by-pass on the line before the chlorinator, as shown in Fig. 3. Some 20 lb of the crystals were placed in the feeder. Since 25 per cent of this chemical material dissolves during the month, it is necessary only to add 5 lb. to the feeder once a month to maintain a reasonably constant rate of chemical feed to the water. The recharging operation requires but a few minutes' time: the valves on the inlet and outlet connections to the feeder are shut, the filler cap at the top of the feeder is opened, and, the chemical crystals are poured in.

A cutaway view of the feeder is shown in Fig. 4. This sketch shows the crystals in place around the inlet strainer at the bottom. There is an outlet strainer at the top to prevent carry-over of the crystals with the outgoing water. The drain removes some of the water from the feeder during the refilling operation. A photograph of the chlorinator and the feeder is shown by Fig. 1.

Following the installation of the feeder, practically all the precipitation was prevented in the chlorinator, so that the unit was able to operate effectively on an automatic basis. It gives 5 to 6 wk trouble-free operation before enough deposit accumulates on the working parts of the chlorinator to affect its functioning. This compares with 1 or 2 da. service prior to the use of the present treatment. As little as one part of the phosphate for each part of manganese is sufficient, according to our experience, to prevent the precipitation of manganese formerly caused by the high concentration of chlorine.

Analysis of a sample of water recently collected between the feeder and the chlorinator is given by Table I. We now have had almost 2 yr of satisfactory chlorinator operation. The chlorine has done an excellent job of preventing the growth of slime organisms in the plant heat exchangers and we are pleased with the effectiveness of the supplementary treatment which has enabled the chlorinating unit to function properly.

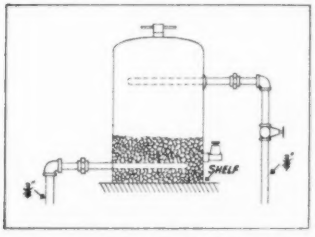


Fig. 4. Cross section of the feeder for the glassy phosphates. Crystals dissolve slowly at a rate of about 25 per cent of the weight per month practically independent of the rate of water flow

Table I. Analysis of water sample collected between the feeder and chlorinator

pH Value	6.9
Bicarbonate, HCO_3	272.0 ppm.
Sulfate, SO_4	215.0 ppm.
Chloride, Cl	45.0 ppm.
Silica, SiO_2	26.0 ppm.
Iron, Fe	0.9 ppm.
Calcium, Ca	127.0 ppm.
Magnesium, Mg	8.0 ppm.
Dissolved Solids	648.0 ppm.
Hardness, $CaCO_3$	351.0 ppm.
Manganese	4.0 ppm.
Micromet	7.5 ppm.

Surface Treatments for Protection of CONCRETE FLOORS

Almost any deteriorating substance can be rendered harmless . . . Data Sheets may be used as guide to protect floors in your plant . . . Several choices of proper treatment may be made and all may be equally effective but the cost may vary . . . Wear-resistance is another factor which must be considered when choosing a protective treatment . . . Numbers in Data Sheets refer to numbered paragraphs in text

UNDER CERTAIN conditions, concrete floors require special treatment to prevent damage to the surface. The plant engineer should have information as to what action certain substances may have on concrete, what to do if the concrete is threatened, information to help in making plant repairs, and a guide for planning future construction or preventive maintenance.

Materials are available for almost any degree of concrete protection desired or needed. The best material to use on a particular job will depend on the substance to be protected against. Degree of concentration and temperature of the destructive agent also must be considered, as high concentration or high temperature may speed up the attack. Where food products are being manufactured or processed, a treatment should be chosen that will not contaminate the finished product with an undesirable taste or odor.

What's Wear Resistance?

Another consideration is the wear-resistance of the treatment. Where the floor is to be subjected to the severe abrasive action of trucking, it will be necessary to use more positive means of protection.

The more common treatments are indicated in the accompanying data sheets. The suggested numbers, listed in these sheets under "Surface Treatment," refer to numbered treatments given in the following text. In almost every case more than one treatment is suggested in the data sheets. Any one of these treatments will provide sufficient protection for the concrete in most cases, but the other recommended treatments will be equally suitable. In making a selection, economy should be considered. Where continuous service over long periods is desirable, it may be economical to use the more positive method of control rather than those of lower first cost which are apt to be less permanent.

Protective coatings usually require dust-free, surface-dry concrete for satisfactory application.

Treatments

1 Magnesium Fluosilicate or Zinc Fluosilicate. The treatment consists of two or more applications. First a solution of about 1 lb of the fluosilicate crystals per gallon of water is used. For subsequent applications about 2 lb of the crystals per gallon of water are used. Large brushes are convenient for applying on vertical surfaces, and mops on horizontal areas. Each application should be allowed to dry. After the last one has dried, the surface should be brushed and washed with water to remove crystals which have formed. The treatment hardens the surface by chemical action and makes it more impervious. Fluosilicates are available from chemical dealers.

2 Sodium Silicate (commonly called water glass). This is quite viscous and must be diluted with water to secure penetration, the amount of the dilution depending on the quality of the silicate and the permeability of the concrete. Silicate of about 42.5 Baumé gravity diluted in proportions of 1 gal with 4 gal of water makes a good solution. It may be applied in two, three or more coats, allowing each coat to dry thoroughly before applying the next one. On horizontal surfaces it may be poured on and then spread evenly with brooms or brushes. Scrubbing each coat with water after it has hardened provides a better surface condition for application of succeeding coats. For tanks and similar structures, progressively stronger solutions are often used for the succeeding coats.

3 Drying Oils. Boiled or raw linseed oil may be used, but the boiled oil dries more rapidly. China wood oil or tung oil and soybean oil are also effective. Applied hot, better penetration is secured. The oil should be applied immediately after heating, however, as it will become more viscous if allowed to stand. Two or three coats may be applied, allowing each to dry thoroughly before the next application. Diluting the oil with turpentine up to a mixture of equal parts gives a better penetration for the first coat. The concrete should be well cured and seasoned before the first application. The oil is sometimes applied after the magnesium fluosilicate (1) treatment, providing a good coating over a hardened surface.

4 Cumar. Cumar is synthetic resin soluble in xylol and similar hydrocarbon solvents. A solution consisting of about 6 lb of Cumar per gallon of xylol with ½ pt of boiled linseed oil makes a good coating. Two or more coats should be applied. The Cumar should be powdered to aid in dissolving. It is available in grades from dark brown to colorless.

5 Varnishes and Paints. Any varnish can be applied to dry concrete. High grade varnishes of the spar, China wood, or Bakelite types and synthetic resin paints and coatings, or paints consisting largely of chlorinated rubber or synthetic rubber give good protection against many substances. Two or more coats should be applied. Some manufacturers can provide specially compounded coatings for certain conditions.

6 Bituminous or coal tar paints, tar and pitches. These are usually applied in two coats—a thin priming coat to insure bond, and a thicker finish coat. The finish coat should be carefully applied to secure continuity and avoid pin holes. The surface should be touched up where necessary.

7 Bituminous enamel. This is suitable protection against relatively strong acids. It does not resist abrasion at high temperatures. Two materials are used, a priming solution and the enamel proper. The priming solution is of thin brushing consistency and should be applied so as to cover completely. Any uncoated spots should be touched up before the enamel is applied. When the primer has dried to a slightly tacky state, it is ready for the enamel. The enamel usually consists of a bitumen with a finely powdered siliceous mineral filler. The filler increases the resistance to flowing and sagging at elevated temperatures and to abrasion. The enamel should be melted and carefully heated until it is fluid enough to brush. The temperature should not exceed 375 F. When fluid it should be mopped on quickly, as it sets and hardens rapidly.

8 Bituminous Mastic. This is used chiefly for floors on account of the thickness of the layer which must be applied, but some mastics can be troweled on a vertical sur-

(Continued on page 31)

DATA SHEET—CONCRETE FLOOR SURFACE TREATMENTS

ACIDS

Material	Effect on Concrete	Surface Treatment*
Acetic	Disintegrates slowly	5, 6, 7
Acid waters	Natural acid waters may erode surface mortar, but usually action then stops	1, 2, 3
Carbolic	Disintegrates slowly	1, 2, 3, 5
Carbonic	Disintegrates slowly	2, 3, 4
Humic	Depends on humus material, but may cause slow disintegration	1, 2, 3
Hydrochloric	Disintegrates	8, 9, 10, 11, 12
Hydrofluoric	Disintegrates	8, 9, 11, 12
Lactic	Disintegrates slowly	3, 4, 5
Muriatic	Disintegrates	8, 9, 10, 11, 12
Nitric	Disintegrates	8, 9, 10, 11, 12
Oxalic	None	None
Phosphoric	Attacks surface slowly	1, 2, 3
Sulphuric	Disintegrates	8, 9, 10, 11, 12
Sulphurous	Disintegrates	8, 9, 10, 11, 12
Tannic	Disintegrates slowly	1, 2, 3

SALTS AND ALKALIES (Solutions)**

Material	Effect on Concrete	Surface Treatment*
Carbonates of Ammonia, Potassium, Sodium	None	None
Chlorides of Calcium, Potassium, Sodium, Strontium	None unless concrete is alternately wet and dry with the solution, when it is advisable to treat with	1, 3, 4
Chlorides of Ammonia, Copper, Iron, Magnesium, Mercury, Zinc	Disintegrates slowly	1, 3, 4
Fluorides	None except ammonium fluoride	3, 4, 5
Hydroxides of Ammonia, Calcium, Potassium, Sodium	None	None
Nitrates of Ammonia	Disintegrates	8, 9, 10, 11, 12
Nitrates of Calcium, Potassium, Sodium	None	None
Potassium Permanganate	None	None
Silicates	None	None
Sulphates of Ammonia	Disintegrates	6, 7, 8, 9

SALTS AND ALKALIES (Continued)

Material	Effect on Concrete	Surface Treatment*
Sulphates of Aluminum, Calcium, Cobalt, Copper, Iron, Manganese, Nickel, Potassium, Sodium, Zinc	Disintegrates; however, concrete products cured in high pressure steam are highly resistant to sulphates	1, 3, 4

PETROLEUM OILS

Material	Effect on Concrete	Surface Treatment*
†Heavy oils below 35° Baumé	None	None
†Light oils above 35° Baumé	None — Require impervious concrete to prevent loss from penetration, and surface treatments are generally used	1, 2, 3, 5, 9
Benzine, Gasoline, Kerosene, Naphtha	None — Require impervious concrete to prevent loss from penetration, and surface treatments are generally used	1, 2, 3, 5, 9
High octane gasoline		12

COAL TAR DISTILLATES

Material	Effect on Concrete	Surface Treatment*
Alizarin, Anthracene, Benzol, Cumol, Paraffin, Pitch, Toluol, Xylol	None	None
Creosote, Cresol, Phenol	Disintegrates slowly	1, 2, 5, 9

VEGETABLE OILS

Material	Effect on Concrete	Surface Treatment*
Cottonseed	No action if air is excluded. Slight disintegration if exposed to air	None 1, 2, 5, 9
Rosin	None	None
Almond, Castor, ‡China wood, Coconut, ‡Linseed, Olive, Peanut, Poppy seed, Rape seed, ‡Soybean, ‡Tung, Walnut	Disintegrates surface slowly	1, 2, 5, 9
Turpentine	None—Considerable penetration	1, 2, 5, 9

*Treatments indicated provide sufficient protection in most cases but any of the other treatments designated by a number higher than the highest shown often may be advisable.

**Dry materials generally have no effect.

†Many lubricating and other oils contain some vegetable oils. Concrete exposed to such oils should be protected as for vegetable oils.

‡Applied in thin coats the material quickly oxidizes and has no effect. Results indicated above are for constant exposure to the material in liquid form.

DATA SHEET—CONCRETE FLOOR SURFACE TREATMENTS

FATS AND FATTY ACIDS (Animal)

Material	Effect on Concrete	Surface Treatment*
Fish oil	Most fish oils attack concrete slightly	1, 2, 3, 5, 9
Foot oil Lard and lard oil Tallow and tallow oil	Disintegrates surface slowly	1, 2, 3, 5, 9

MISCELLANEOUS

Material	Effect on Concrete	Surface Treatment*
Alcohol	None	None
Ammonia water (am. hydroxide)	None	None
Baking soda	None	None
Beer	Beer will cause no progressive disintegration of concrete, but in beer storage and fermenting tanks a special coating is used to guard against contamination of beer	Coatings
Bleaching solution	Usually no effect. Where subject to frequent wetting and drying with solution containing calcium chloride provide	1, 3, 4
Borax, boracic acid, boric acid	No effect	None
Brine (salt)	Usually no effect on impervious concrete. Where subject to frequent wetting and drying of brine provide	1, 3, 4
Buttermilk	Same as milk	3, 4, 5
Charged water	Same as carbonic acid—slow attack	1, 2, 3
Caustic soda	None	None
Cider	Disintegrates (see acetic acid)	5, 6, 7
Cinders	May cause some disintegration	1, 2, 3
Coal	Great majority of structures show no deterioration. Exceptional cases have been coal high in pyrites (sulphide of iron) and moisture showing some action but the rate is greatly retarded by deposit of an insoluble film. Action may be stopped by surface treatments	1, 2, 3
Corn syrup	Disintegrates slowly	1, 2, 3
Cyanide solutions	Disintegrate slowly	7, 8, 9, 10, 12
Electrolyte	Depends on liquid. For lead and zinc refining and chrome plating use	7, 8, 9, 10, 12
	Nickel and copper plating	None

MISCELLANEOUS (Continued)

Material	Effect on Concrete	Surface Treatment*
Formalin	Aqueous solution of formaldehyde disintegrates concrete	5, 9, 10, 11, 12
Fruit juices	Most fruit juices have little if any effect as tartaric acid and citric acid do not appreciably affect concrete. Floors under raisin seeding machines have shown some effect, probably due to poor concrete	1, 2, 3
Glucose	Disintegrates slowly	1, 2, 3
Glycerine	Disintegrates slowly	1, 2, 3, 4, 5, 9
Honey	None	None
Lye	None	None
Milk	Sweet milk should have no effect, but if allowed to sour the lactic acid will attack	3, 4, 5
Molasses	Does not affect impervious, thoroughly cured concrete. Dark, partly refined molasses may attack concrete that is not thoroughly cured. Such concrete may be protected with	2, 5, 9
Niter	None	None
Sal ammoniac	Same as ammonium chloride—causes slow disintegration	1, 3, 4
Sal soda	None	None
Saltpeter	None	None
Sauerkraut	Little, if any, effect. Protect taste with	1, 2
Silage	Attacks concrete slowly	3, 4, 5
Sugar	Dry sugar has no effect on concrete that is thoroughly cured	None
	Sugar solutions attack concrete	1, 2, 3
Sulphite liquor	Attacks concrete slowly	1, 2, 3
Tanning liquor	Depends on liquid. Most of them have no effect. Tanneries using chromium report no effects. If liquor is acid, protect with	1, 2, 3
Trisodium phosphate	None	None
Vinegar	Disintegrates (see acetic acid)	5, 6, 7
Washing soda	None	None
Whey	The lactic acid will attack concrete	3, 4, 5
Wine	Many wine tanks with no surface coating have given good results but taste of first batch may be affected unless concrete has been given tartaric acid treatment.	For fine wines the concrete has been treated with 2 or 3 applications of tartaric acid solution. (1 lb. tartaric acid in 3 pints water.) Sodium silicate is also effective. In a few cases tanks have been lined with glass tile.
Wood pulp	None	None

*Treatments indicated provide sufficient protection in most cases but any of the other treatments designated by a number higher than the highest shown often may be advisable

face. Some mastics are applied cold. Others must be heated until fluid. The cold mastic consists of two compositions—the priming solution and the body coat or mastic. The primer is first brushed on. When the primer has dried to a tacky state, a thin layer—about 1/32 in.—of the mastic is troweled on. When this has dried, successive 1/32-in. coats of the mastic are applied until the required thickness has been built up. The mastic is similar to the primer but it is ground with sufficient asbestos and finely powdered siliceous material fillers to make a very thick, pasty, fibrous mass.

The hot mastics are somewhat similar to the mixtures used in sheet asphalt pavements, but contain more asphaltic binder so that when heated to fluid condition, they can be poured and troweled into place. They are satisfactory only when applied in layers of 1 in. or more in thickness. When ready to lay, the mixture usually consists of about 15 per cent asphaltic binders, 20 per cent finely powdered siliceous material, and the remainder sand graded up to ¼-in. maximum size.

9 Vitrified brick or tile. These are special burnt clay products which possess high resistance to attack by acids or alkalies. They must, of course, be laid in mortar which is also resistant against the substance to which they are to be exposed. A waterproof membrane and a bed of mortar are usually placed between the brick or tile and concrete. Some of the acid-resistant cements are melted and poured in the joints. Only materials suitable for the conditions should be used, and the manufacturer's directions for installation must be followed. Silica brick and cement are not resistant to hydrofluoric acid and the hydroxides, but special brick and cement for these substances are available.

10 Glass. Glass may be cemented to the concrete, as recommended by glass manufacturers. Cement for fastening glass to concrete surface is provided by the glass manufacturer.

11 Lead. Lead may be cemented to the concrete with asphalted paint. Smaller lead sheets may be fused into a large, continuous sheet by "burning" them together.

12 Sheets of synthetic resin, rubber, and synthetic rubber. Thin sheets of synthetic resin, rubber or synthetic rubber resistant to many acids, alkalies, and other substances are available. These are cemented to the concrete with special adhesives.

Protection Against Brine Solutions

Many solutions, such as brines and salts, which have no chemical action on concrete may crystallize upon loss of water. It is especially important that concrete subject to alternate wetting and drying of such solutions be impervious. When the free water in the concrete is saturated with salts, the salts crystallize in the concrete near the surface in the process of drying, and this crystallization may exert sufficient pressure to cause surface scaling. Salt solutions corrode steel more rapidly than plain water. In structures which are to be subjected to frequent wetting and drying by these solutions, it is essential to provide impervious concrete and sufficient coverage over the steel, and it may be advisable to provide some surface coating such as sodium silicate, linseed oil or one of the varnishes, as an added protection.

Portable Incinerator Heats Water, Saves Money

Contributed by F.S.R., Chicago

DECIDING THAT the firing of one of the company's large boilers was too expensive, H. Leute, Maintenance Supervisor, Precision Scientific Co., installed the portable incinerator shown in the photo. Results in dollars saved and in other tangible benefits have been more than satisfying.

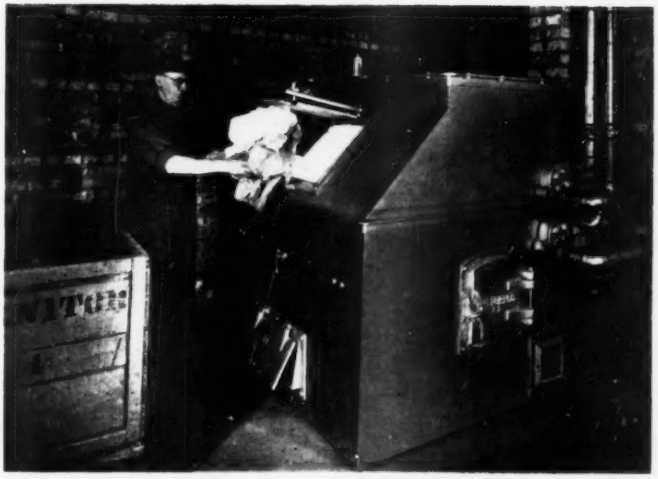
The unit installed has a water heating element which enables the incinerator to serve the double purpose of disposing of rubbish while supplying hot water at the same time. Five hundred employees were furnished with this commodity in addition to the normal requirements of Precision's cafeteria and acid rinsing tanks. The hot water is stored in a 1250 gal tank. During the summer of 1947 hot water was obtained by operating one of their two Pacific boilers. The boilers were used only for the purpose of producing hot water and the oil consumption was between 500 and 600 gal per week. During the summer of 1948 the heating plant was used only as a booster and was fired for approximately one hour in the morning, only.

The burning of rubbish and sweepings with approximately ¼ cord of scrap wood daily in the incinerator has maintained sufficient hot water for all purposes at a temperature of about 120 F throughout the day. Oil consumption averaged 100 gal per week throughout the summer, a clear savings of 400 to 500 gal per week.

In addition, the incinerator is saving an additional $900.00 or more per year, the previous cost of trash disposal. At 15c per barrel it formerly cost about $18.00 per week to haul away approximately 20 barrels per day; frequently, this amounted to as much as 25 barrels per day. In addition to the cost of hauling, the storage and stacking of the trash was an expensive nuisance which was eliminated when the incinerator was installed.

Name of the manufacturer of this type of incinerator will be supplied upon request. Simply write "Portable Incinerator" on one of the post cards in this issue and drop it in the mail box. No postage necessary.

Plant Engineering
Product Application Feature



This incinerator is a packaged unit, shipped on skids, and it can be connected to any existing stack or breeching, or a separate steel stack may be employed

Floor Machine Gets Elevated
IT'S ON THE ROOF, NOW!

This roof maintenance machine is the direct outgrowth of a standard floor machine slightly modified for work on roofs . . . Some plants have used their standard floor machines for small-area work or for patching . . . Some roof cleaning jobs have been completed 300 per cent faster than by hand methods . . . A gross labor savings of $1100.00 was made on one job . . . Does three jobs: Removal, Sweeping and Cutting

LAST YEAR something was really done for maintenance men who have the tough and unpleasant job of removing pitch and gravel from built-up roofs. An old-line manufacturer of floor machines poked his eye over the roof cornice one day and took note of this back-breaking job. By slight alterations of his standard machine—larger wheels to allow easier movement of the machine over coarse gravel; special sealing to prevent excessive dirt and dust from entering the motor; special air intake elevated above dust; and a few others—the machine was ready for its new job.

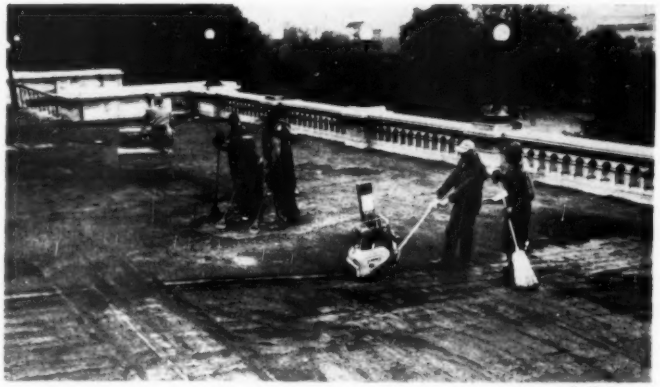
Standard or Heavy Duty?

It is true that the company's standard floor machine, which is equipped with an accessory identical to the one used for scarifying roof surfaces, has been used for small areas and for patching work. For heavy work, however, the manufacturer believes the machine built especially for the job is the one to use.

This two-wheeled, gasoline-powered, portable unit has two uses besides that of removal of pitch, slag and gravel from roofs. It can smooth, level and sweep decks in preparation for re-mopping and it can cut deck insulation (including pitch and gravel topping) into easily removable squares.

In a typical roof cleaning job the operator guides the machine around the roof allowing the unit to propel itself by action of its revolving drum. Driven by V-belts the drum's rotary cutters shear off heavy encrusted pitch and gravel with a smooth, fast-cutting action. The pitch is pulverized while the gravel is hurled backward where it hits a protective chain-curtain in front of the operator's feet. It forms semi-windrows which then can be shoveled up.

Readers who wish further information on this roof-cleaning machine may obtain it by writing The Editors. Or simply mark "Roof-Cleaning" on post-paid card between pages 18-19 or 58-59 and drop it in the mailbox.



G. H. Tennant

This photograph shows slag and pitch being removed by the roof scraping machine in the foreground. The loosened material is then picked up by the sweeper in the background; the sweeper carries the load to a waiting truck which, when filled, carries the gravel and tar to the disposal point without further handling. Center group of workers demonstrate hand method of cleaning roof

For tear-off jobs the machine is fitted with a special cutter which slices through the roof covering with a fast sawing action. Rate of cut usually is that of a normal walk. After the roof has been criss-crossed with the machine and cut into easily-handled squares the individual sections are pried up with a scrape bar.

Speed of operation of the machine on cleaning jobs varies widely with working conditions. Speed of action is determined by: age of the roof; hardness of the pitch or asphalt; consistency and depth of remaining slag or gravel. On the roof of a Southern Railway roundhouse there was an area of 81,000 sq ft to be cleaned. Money allowed for labor costs on the job amounted to $1600.00; actual costs, using the machine, were $500.00. The manufacturer, however, points out that this was an unusual case and such savings could not always be expected.

Besides speed and cleanliness one of the major advantages of using the machine is that the planing action of the mechanical scraper provides a much smoother surface. This helps prevent formation of moisture pockets and aids in getting a good bond between felts without danger of ridges or buckles.

The attitude of organized labor toward these machines has been reported by some companies to be exceptionally good. At a Roofers' Convention, the manufacturer was asked to demonstrate the machine. The reason for this attitude is the fact that roof scraping has the reputation of being the most back-breaking and man-killing of all maintenance work. Hand scraping is slow, dangerous and ineffectual many workers state.

Plant Engineering
Product Application Feature

Fig. 1. This operator is straightening dents in aluminum beer barrels. Method can be used on other types of containers

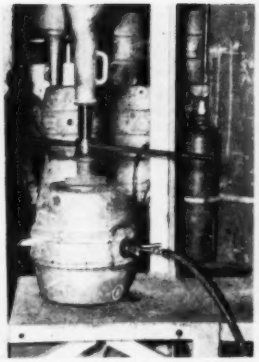


Fig. 2. Repairing a bearing at Dow Chemical Co.'s. plant. Note the exhaust pipe for carrying away poisonous fumes

Examples of GOOD MAINTENANCE WELDING

By CLAYTON B. HERRICK*

Selected case studies from plants in various industries which show the universal acceptance and usefulness of maintenance welding in industry . . . How welding fits into maintenance work, the equipment necessary, how it is employed by many plant engineering departments

MAINTENANCE welding has long been relegated to a comparatively unimportant position—that is, relative to production operations. Without maintenance welding, however, there would be very little production in most of our manufacturing plants.

Naturally, the size of a plant and the amount of equipment in the plant should determine the maintenance setup. Some of the larger plants possess facilities comparable to those of medium-sized fabricating shops, and of course, do a considerable amount of fabricating for their own use. Many small plants get along with only one or two oxy-acetylene outfits, and in some cases, use them only for emergency jobs.

Figure 1 shows a rather unique application for oxy-acetylene equipment in a brewery. Aluminum beer barrels, dented or otherwise damaged, come into the shop by the hundreds to be straightened and repaired. The barrel is set in position under a jack, hooked up to an air hose and subjected to approximately 70 psi pressure. Simultaneously, the operator plays the oxy-acetylene flame around the dented area. He stands behind a sturdily constructed guard which has an opening for the extension to his torch. The wall thickness of this 15½ gal half barrel is ⅛ in. Gradually the metal, under an excess acetylene flame, weakens locally and with the air pressure being applied, the dent comes out. Next the barrel is tested, both for leaks and capacity. A tolerance of plus or minus one pint must be adhered to strictly.

All barrels coming into the plant are checked for dents, cracks, and holes. First a visual inspection is given and those showing cracks or holes are directed to the welding section of the cooperage shop. Others are filled with air and submerged in water. Leaks are marked and those needing repair are routed to the welding repair station. The barrels are positioned in a wooden buck at a handy height for the operator.

Another common application on these aluminum barrels is that of weld-repairing bottom valve castings. When threads are stripped, a replacement casting is welded in.

Dow Chemical Co. is a plant which requires well over 100 oxy-acetylene outfits to handle the tremendous number of maintenance and repair jobs which are continuously arising. A large percentage of these units are used throughout the plant for "on the spot" repairs and installations. Although there are eight separate shops under the company's maintenance division, most of the welding is done in the boiler and pipe shops.

On one side of the boiler shop is a row of welding booths in which are handled jobs brought into the shop. Typical of the smaller jobs is the bearing depicted in Fig. 2. This cast iron part, which is 1½ in. thick, broke in two pieces. The operator has beveled both sides in preparation for welding, has preheated the part to approximately 400 F, and is beginning to weld with a ⅜ in. brass rod. On completion of the welding, he will wrap the bearing in asbestos for slow cooling. Attention is called to the use of clamps for holding the two parts in alignment, and to the fume collector which is used on all bench jobs in this department.

Another section of the boiler shop is used for layout work and for automatic flame cutting. Thousands of flanges of various sizes are cut out at this work station. The top of the cutting table is made up of 8-in I beams, which may be moved in either direction.

The pipe department has 20 oxy-acetylene outfits in the shop and 65 portable units to handle the installation and maintenance of thousands of miles of piping throughout the plant. All pipe welders go through a lengthy training period before they are qualified to weld pipe.

As our representative rubber company, let's take a look at B. F. Goodrich, Akron, Ohio. This plant is comprised of 116 buildings containing 165 acres of floor space. They have four different departments where various welding plays a major role—the weld shop, the structural department, the tin and mold shops.

Each man has his own portable equipment with his name, department number and department phone number thereon, and is responsible

* From a paper presented before the 50th Convention of the International Acetylene Assn.

for that outfit. All gages are checked every 30 days. As a safety measure all units are equipped with fire extinguishers.

A row of six welding benches is where oxy-acetylene cutting and welding takes place on jobs which come into the weld shop. Three chain hoists are used for handling heavy parts. These account for a great saving in time and energy. Complete safety equipment includes fume collectors.

It is estimated that there are approximately 25,000 miles of piping running throughout the Goodrich plant. A great amount of welding takes place on new piping installations. Several of the welding operators are qualified for welding high pressure piping.

Our representative foods company is Kraft in Chicago. Kraft is taking full advantage of the unlimited possibilities welding offers. Their shop is really a three-in-one combination of welding, sheet metal, and piping. There is complete equipment for shearing, rolling and forming light materials. The plumbing shop is theoretically a unit in itself, but adjoins the welding shop, and for all practical purposes, is a part of it. Here there is equipment for cutting, forming and welding pipe. A full stock of pipe fittings is carried to properly fill the requirements of numerous piping jobs.

There are several oxy-acetylene units, all of which are portable. Although most of the cutting and welding is performed in the shop, there are frequent demands for equipment around the plant to take care of repair, maintenance and new installations. This applies particularly to cookers, holding tanks and pipe lines.

The piping job depicted in Fig. 3 is a double strainer for an oil line. For the end members 2 in. pipe is used, whereas 3 in. pipe is used for the side members. The welding fittings used are elbows, tees and flanges. The 2 in. and 3 in. pipe is carried in stock and flame-cut to length as required. The oxy-acetylene welder shown is an expert on pipe, as may be noted by the smooth, full, sound looking welds he is making. In this picture note the use of welded pipe stands which may be adjusted to handy height. This contributes definitely to operator comfort, and hence to a better welding job.

Another plant which does a very outstanding job of maintenance welding is the Armstrong Cork Co. To handle its large amount and variety of work requires a well-equipped welding shop. Armstrong's equipment includes ten oxy-acetylene welding outfits, two automatic torch cutting units, metallizing apparatus and a flame hardening outfit.

Of especial interest is a very practical and successful setup which has been developed, and is used whenever a new job is scheduled for repair. A conference is held with all parties concerned sitting in. This might include the shop superintendent, welding supervisor, machine shop supervisor, head of the blacksmithing department and representatives from the routing section. All aspects of the job are discussed and a definite procedure is worked out. The routing section, which is part of the engineering shop, maps out the sequence for the job and sets up a schedule indicating starting time, length of time in each department, and finishing time. A standard form, filled in, is shown in Fig. 4.

The welding supervisor sets up the precedure to be followed in his department. This means specifying material, rod to be used, diameter, and welding sequence, if a particular one is used.

Many jobs get to be routine, and once a definite, successful procedure is developed, it is used again for the same job. Accurate records are kept of time, materials, cost and length of service. Various methods and materials are constantly being tested in working toward the best possible solution for a given repair or maintenance job.

To round out this presentation is the following maintenance welding picture which applies to Caterpillar Tractor Co., Peoria, Ill. This plant covers 400 acres of ground. Upon completion of a 43 million dollar expansion program, there will be 126 acres under roof. The company employs over 21,000 workers, which number will be considerably increased. In checking the company organization chart, we find that the maintenance comes under the Plant Engineering Department. There is a Superintendent of Maintenance under the Plant Engineer. The General Foreman of the Maintenance Welding Department comes under the Superintendent of Maintenance. These are five separate maintenance welding shops located as follows: Tractor Division Section, Road Grader Division, New Engine Building, Foundry, and Research Department.

Included in the equipment of the Maintenance Welding Department are 60 oxy-acetylene outfits (all portable), three automatic flame cutting units, plus a variety of inert-arc, metal spray and arc welding equipment. Throughout the entire plant there are 134 gas welding outfits, plus several manifold units, all of which are maintained by the Maintenance Welding Department. There are two stations for the repair of oxy-acetylene equipment. There are two specialists who check all gas welding equipment every 30 days. These men repair equipment "on the spot" if the difficulty is not serious. If necessary, equipment is replaced and the parts to be repaired are brought into their repair stations. A complete supply of parts is carried, in fact, if necessary, a complete torch or regulator can be built.

Fig. 3. Installing a double strainer on an oil line in the maintenance shops at Kraft Foods in Chicago

CUTTING & WELDING PERMIT

No. 6660 Date 3-17-49

LOCATION OF JOB

BUILDING 111 FLOOR 1st

DEPT. 12 SECTION W-20

WORK TO BE DONE Welding base of Machine

TIME STARTED 7:30 AM COMPLETED

INSPECTOR'S RECOMMENDATIONS

Wet down area and cover motor and machine. Have fire extinguisher on job and fire inspector stand by.

E. Buckles
Inspector

OPERATOR: If a fire occurred, explain:

O. K.

See Other Side C B Hawes
Operator

INSTRUCTIONS

It is required that foreman, operators, helpers, and others responsible for the work, follow all the precautions outlined below, as well as any extra precautions recommended by the fire inspector.

1. Equipment to be used must be in good condition.
2. Equipment must not be used in presence of inflammable vapors and liquids, or tanks or other containers which have previously contained such materials.
3. Floors and surroundings must be swept clean. Wet down wooden floors or protect with sheet metal, flame-proof canvas or equivalent.
4. Move combustible materials and supplies at least forty feet away. When this cannot be done, cover with metal guards, flame-proof canvas, or equivalent.
5. Remove inside deposits of ducts, collectors, etc., before beginning work.
6. If necessary, extra men must be provided to watch sparks that may fall to floor below through cracks, doors or other openings.
7. Provide close at hand sufficient hand or wheeled extinguishers, water pails, or hand hose to extinguish any fire that may start.
8. After completion of work, inspect entire area. Keep a watcher on the scene at least thirty minutes longer.

Fig. 4. Right: This is the type of welding work form which is used at the plant of Armstrong Cork Co.

Play Safe When Cleaning Gasoline Tanks

Gasoline hazards should not be minimized . . . Explosive vapor air mixtures range from 1 to 6 per cent . . . Hazards of empty storage tanks and unused gas lines . . . Vapors seek the lower levels and tend to hug the floor . . . Don't trust your nose, use an indicator . . . Sludge in tanks . . . Ventilating large tanks, safety clothes, protective devices and masks

By ELLIS LOCHER, Assistant Manager of Safety, Ethyl Corporation

EVERY INDUSTRY has its methods of dealing with various safety problems, and a study of the tank-cleaning methods recommended by Ethyl Corp. and the API offer one way of solving one special safety problem. Certainly the applications of these techniques in other fields should not be attempted without adequate advice, but this approach to the problem may help in handling similar situations in other industries.

Good safety common sense makes the assumption that a dangerous situation continues to be dangerous until a method of safely handling it is developed. Gasoline is no exception to that rule. However, the wide use of gasoline has given the public a certain amount of indifference to its potential danger. Thus no safety program involving the handling of gasoline should be attempted until those involved thoroughly understand the characteristics of this fuel.

Liquid gasoline by itself does not burn or explode, but its vapors do. An electric igniter, submerged in gasoline can spark without starting a fire. But when the gasoline and air mixture reach the right proportions they are ignitible and, if confined, explosive. In other words, there must be air (oxygen), fuel, (gasoline vapor in this case), and ignition temperature before there will be a flame or an explosion.

Explosive Mixtures

Gasoline vapor-air mixtures burn or explode if they are in concentrations ranging from 1 to 6 per cent of gasoline vapor by volume. Concentrations of less than 1 per cent are too lean and those over 6 per cent are too rich. A gallon of gasoline, for example, can form 30 cu ft of concentrated vapor. This is enough to put a small bulk plant tank of 20,000 gal of approximately 3,000 cu ft in the explosive range. That is why so-called "empty" storage tanks may be more of a hazard than those which are full or partly full. The same danger exists when lines, presumably free of gasoline, are welded. Vapors forming above liquid gasoline stored in tanks, however, are usually too rich to take fire or to explode. Either filling or emptying large tanks can produce combustible air-vapor mixtures. The hazard at these times is high.

Floor Hugging

Gasoline vapors tend to seek low levels because they are heavier than air. This is especially true in enclosed spaces where the ventilation is insufficient to keep the vapors in motion and diffused. Gasoline spillage in places such as shops, garages, and plants can create "floor hugging" vapors where a source of ignition is most likely to occur. Vapors from an open storage tank have been known to travel downhill for a considerable distance, become ignited, and flash back to the tank thereby causing a fire.

When liquid gasoline comes in contact with the skin it may cause blisters, burns, a rash, or just extreme dryness. This depends upon the extent of contact. Gasoline vapors should be treated with extreme caution. Vapors in concentrations of more than one part to 1,000 parts of air are toxic. A 1,000 bbl tank can become toxic from vapors of less than 1 gal of liquid gasoline. Naturally, clothing which has been soaked with gasoline should be removed at once. Gasoline in clothing can damage the skin. The vapors may cause sickness, and the fire hazard needs no further explanation.

The presence of a gasoline odor is ample evidence of gasoline vapors and serves as a warning of possible toxicity or fire hazard. The nose is not a reliable device, however, and good safety procedure calls for the use of a combustible-gas indicator. This instrument registers gasoline vapor concentrations from 0.1 per cent, the upper breathing limit for short periods, to a full 1 per cent, the lower explosive limit.

Almost all commercial grades of automotive fuels contain tetraethyl lead in concentrations of not more than 3 cc per gal of gasoline. This amount is so small that no significant hazard is added to the gasoline by the presence of tetraethyl lead in the mixture. But after tanks have stored leaded gasoline for some time, the sludge in the bottom of the tank may harbor quantities of tetraethyl lead which give off poisonous vapors. These vapors are not measurable by a combustible-

Fig. 1. Any safety operation must be worked out according to the individual circumstances. Large gasoline storage tank cleaning jobs call for the use of airline hosemasks. Note the rubber boots, gloves, harness and life lines

gas indicator and entering a tank of this nature should not be attempted without the advice of an expert, and adherence to complete precautionary procedures.

In fact, no gasoline tank cleaning operation should be attempted without first consulting the API Manual. "Cleaning Petroleum Storage Tanks, Section B—Gasoline Tanks." This publication gives all the important details concerning safe tank-cleaning methods. In simple language, however, it is good practice not to enter a tank until all the combustible vapors have been removed. Continuous ventilation aids materially in keeping the combustible hazard at a minimum.

Ample ventilation is one of the most important phases of any gasoline tank-cleaning operation. A tank can be ventilated naturally when the roof and shell manholes are uncovered and the tank is allowed to stand until it becomes vapor-free. This method, however, is slow and uncertain. It depends on changes in temperature, wind direction, and wind velocity, to set up the necessary air currents to free the tank of vapor.

Steam has frequently been used to volatilize the hydrocarbons in a tank. The purpose of steam is to increase the temperature inside the tank thus accelerating natural ventilation, and, to saturate the hydrocarbon vapors rendering them noncombustible. However, this is difficult if not impossible to attain in practice with the exception of very small tanks and containers.

Some form of forced or controlled ventilation is probably the best method of preparing the atmosphere of a tank before entry. While fans or blowers are sometimes employed, usually a steam or compressed air exhauster is used. In most respects this method is superior either to natural ventilation or steaming.

As a matter of good safety procedure no gasoline tank should be entered for cleaning unless all the personnel wear the proper protective clothing, preferably white or of a light color, and protective rubber gloves and boots.

Special attention should be given to the airline hosemask which is the only satisfactory method of assuring each worker of a constant supply of fresh air. This mask should fit snugly and any evidence of leakage should be traced and corrected. Canister masks, while useful in certain hazardous areas, are not considered adequate for tank cleaning work. Although this article has presented one method of dealing with a specific safety problem, none of the techniques mentioned herein should be applied to other problems without careful investigation.

Air Conditioned Cab for Hot Spots

Contributed by Dravo Corporation

INDUSTRY LONG has been aware of the extreme conditions under which operators of cranes handling hot metal have to work. Not only do temperatures in the crane cab become exceedingly high, but often there also are noxious fumes, gases and dust.

Large fans were first used in the cabs, but about all these succeeded in doing was to change the air—hot air for hot air. Later attempts were made to control these conditions by hanging wetted burlap over the intake of the fan.

To improve upon this, cakes of ice were placed in a specially built chamber and the air was blown over them and into the cab. Besides being comparatively inefficient and incapable of cooling the air sufficiently, this practice added the serious problem of disposal of water resulting from melting ice.

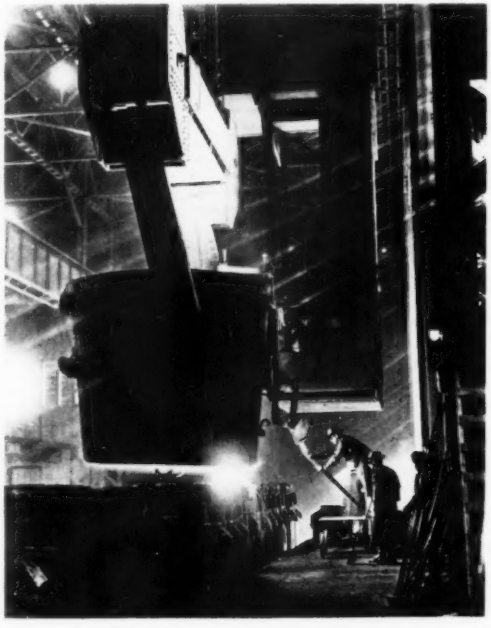
When "dry ice" became commercially available this was tried in place of ice because it did not drip water and lasted a little longer than ice. At that time some special cabs were built with dry ice compartments, built-in ducts, fans and dust filters. No control of temperatures or fumes was available, however.

Considerable improvement over earlier methods was effected with the introduction ten or twelve years ago of air conditioning units employing water for condensing purposes. While better than the earlier makeshifts they were bulky and comparatively inefficient. The most important troubles from this type of unit developed from the use of water for condensing.

The chief disadvantage in this equipment, and an inherent one, was that the water in the storage tank absorbed heat from the high-temperature air surrounding the cab. The water became so warm that it was almost impossible to condense the refrigerant.

So the need remained for a practical method of air conditioning the cabs of cranes that operated in high temperatures. In 1943, our company decided to solve the problem. An installation was made that used air as a condensing medium and required only electrical connections for operation. This installation was made on a crane operating over lead vats and fume removal equipment was incorporated. The need for water, water storage tanks and piping, with their attendant high maintenance costs and lost time, was eliminated.

Performance of this first installation led the company to start production of a completely self-contained standard crane cab air conditioning unit for general industrial use.



Despite extremely high temperatures in the surrounding area, the operator of this 125-t ladle crane at the Jones & Laughlin Steel Corp., Aliquippa Works, is kept comfortable because his cab is air conditioned

Why Music Hath Charm—and Profit

By GEORGE W. DYSON
Machine & Metal Trades High School, New York, N. Y.

How music increases industrial efficiency . . . Why high fidelity equipment is essential . . . When music should be played . . . What selections give best results . . . Where the recorder should be located . . . Selection and qualifications of the program director . . . Cost and personnel considerations . . . Timing the program

FOR A CONSIDERABLE time it has been known that music hath charms to soothe the savage beast. The question that is now being raised is, "Does music have the power to increase the industrial efficiency of the worker?" The answer is an Unqualified "Yes!" Music will increase the industrial efficiency of the worker.

It will level out production curves eliminating to no small extent those dips that give production managers a psychosis. It will reduce absenteeism. It will reduce accidents. In short, an industrial broadcasting system, *properly* installed and *properly* operated will make a substantial contribution to the profit side of the ledger.

It is unfortunate that it was necessary to insert qualifying words *properly* installed and *properly* operated, but the success of any industrial broadcasting system depends entirely upon its installation and operation. The installation of a $50 radio operated by Tilly the Toiler is not going to give the accountants reason to throw away their red ink. Quite the contrary!

Before there can be music, there must be an installation. Brushing aside all the details so dear to the heart of the radio technician, it will be granted that regardless of the type of installation that there must be speakers to convert the electrical impulse into a sound impulse conveying the impression of music to the ear. The type and location of these speakers will vary with the room and the operation that is being carried on in that room. An office, a drafting room, a filing room, a stenographic pool, yes, even a foundry, will have to be treated as an individual problem and the correct diagnosis made.

The speaker is the medium by which music reaches the ear of the worker. If it were a perfect medium it would transmit sound waves in the frequency range of from 16 to 20,000 cps because that is the range to which the human ear is sensitive. Perfection is not necessary, however, as the range of reproduction of music is between 40 and 16,000 cps. Even these figures are higher, that is, the spread of the frequency is greater, than are normally encountered. But if industrial efficiency is the goal, the speakers should be capable of handling at least 10,000 cps.

Unfortunately, the selection of the speakers on a basis of frequencies transmitted is not the complete answer to the problem. They must be fitted into the room taking into consideration the acoustics and background noise. There must be the right number of speakers in the *proper* location. Again the word *proper* raises its ugly head. As a source of music for these *properly* installed speakers the production manager can call upon the radio, phonograph records, wired music and employee participation.

While a small plant may derive some benefit in improved employee efficiency by the use of the radio, in the main, this source of music offers few possibilities. Radio programs are not tailored for the purpose of increasing production. Like Tennyson's Brook they flow on and on and it is believed that most production managers would take a dim view of their overall quality. There remains, then, two sources of music for the worker. One is the self-contained factory broadcasting system and the other is the use of wired music.

A factory broadcasting system requires the installation of equipment which permits the broadcasting of phonograph records and the efforts of employee organizations. This necessitates the installation of turntables capable of record reproduction at both 33⅓ and 78 rpm, pick up heads, microphones and amplifiers. There must be control panels, volume level indicators and other equipment necessary to make the electrons behave. The installation, it goes without saying, must be properly selected and installed.

Such an installation permits: the reproduction of standard phonograph records (78rpm) and records from

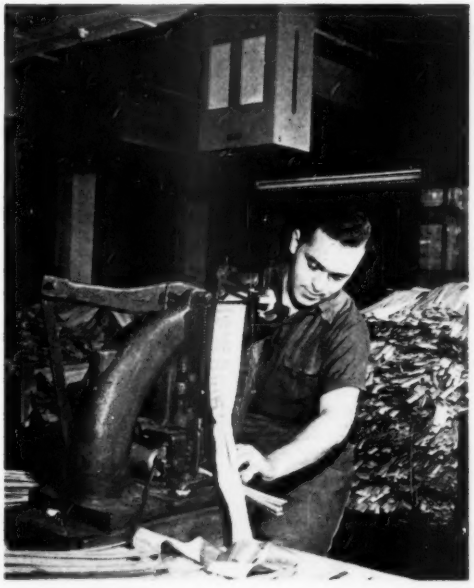


Fig. 1. Music is particularly effective on monotonous work of a repetitive nature where boredom or nervous tension leads to errors and accidents through inattention, carelessness and bickering among employees. Various studies show production gains of from 1 to 16 per cent due to the use of music, probably 4 to 6 per cent is representative. Reduction in early departures and absenteeism is a significant factor

transcription libraries (33⅓ rpm); the efforts of employee organizations such as orchestras, glee clubs; and the use of equipment for paging and other uses to which a fertile mind can apply a high fidelity broadcasting equipment. Remember, we can't get those 10,000 cycles out of the speaker unless the amplifier makes it available, therefore we must have high fidelity equipment.

Up to this point, the problem, even though complicated by a redundancy of "propers" has not been difficult of solution. The mechanical-electrical equipment is available and qualified technicians and engineers will, for a suitable monetary consideration, make an acoustically efficient installation. The speakers will be located properly, the amplifier will transmit and amplify the signal that the recording head introduces. But, what of the music that goes over the system?

Yes, what of the music that goes over the system!

Once the system is installed, everyone in the plant knows what record should be played, how long they should be played and the only ones who look with a jaundiced eye upon the playing of music are the public relations man and the sales promotion manager. They have their own point of view as to the purposes to which the equipment should be used.

As the result of research by such organizations as the Sound Research Department of the Stevens Institute of Technology and the Research Laboratory of Muzak Corp., to name only two, a growing body of research data regarding the psychological and physiological effect of music is being accumulated. The plodding efforts of the research worker are superseding the rapid, but extremely unreliable, work of the guesser. Facts are beginning to crystallize from a solution of surmises, guesses, hunches and personal likes and violent prejudices.

What is the Gain?

First, what is the gain in tangible production efficiency? Harold Burris-Meyer, reporting in 1943, gave evidence of gains of from approximately 4 to 6 per cent. The same study indicated significant reduction early departures and Monday morning absenteeism. Unfortunately, Professor Burris-Meyer's study was interrupted by the war. Later studies, reported by the National Industrial Conference Board and Muzak Corp. indicate efficiency gains of from 1 to 16 per cent. This tangible evidence of increase in production is based upon production figures and are believed to be representative. They do not, however, tell the complete story.

Intangible is a pretty word and it rolls trippingly off the tongue. It means something that you cannot put your finger on. There are a lot of gains which result from industrial

All photographs courtesy Muzak Corp.

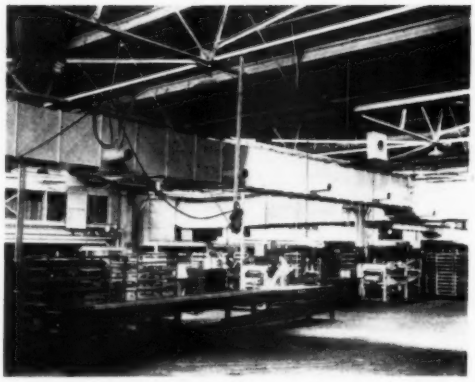


Fig. 2. The first requirement is high fidelity equipment with speakers properly installed, the second is selection of a program suitable to the location, time and place and, the third is the amount. Studies indicate 2½ hr of music per 8 hr shift is the maximum desirable. This should be in 12 to 20 minute periods

Fig. 3. Record selection, timing and volume modulation are important. In this installation the turntable operator plays records at intervals indicated by the prepared schedule on the board in front of her. Programs should be prepared with the type of audience and their work kept in mind

music that are classified as intangible.

There is no objective scale by which you can measure the amount of bickering among employees, but it is a production factor and seems to be less apparent when industrial music is available. Boredom leads to mistakes and it is particularly a factor where the operations are largely repetitive. Again, studies indicate that industrial music, while not eliminating entirely, does reduce the amount of boredom.

Other intangibles which must be given the once over lightly are reduction in nervous tension, fatigue and improvement in morale. Certainly these are factors which enter into the production equation. Evidence is incontrovertible that they are definitely influenced by music. Once the premise is granted that industrial music makes more attractive the production picture we must examine more closely the way it is to be applied. The type of music played, the length of playing time and the time of playing must be as carefully prescribed as a doctor's recommendation for strychnine. Too much, wrongly administered, is apt to prove fatal.

Continuous playing of music builds up within most people a defense mechanism that completely shuts out the music. A radio blaring away ceases to be heard. Research studies seem to indicate that a maximum of 2½ hr of music per 8 hr shifts is about the limit. This prescription is to be taken in about 12 to 20 min doses for maximum benefit with 10 to 15 sec intervals between selections.

In programming the playing periods, it must be recognized that there are periods in the day when the human machine slows down. Each afternoon the English stopped the war at 3 o'clock to have their cup of tea. Some production managers allow their employees "smoke periods" while others just stare glumly at the periodic slump in the production curve. If the music is introduced over the system just before the slump begins and continues through the fatigue period, the curve will tend to straighten out and the average height of the curve will rise.

There is an old saying that if one is to make a rabbit stew one must first catch the rabbit. In this article we have reversed the process. We have gathered together all the ingredients of the stew, that is, the equipment, the length of playing time and the time of playing. But, we have left to the last, the catching

Fig. 4. Part of the Muzak master control room through which wired music is sent to many subscribers. Programs are monitored to insure the right kind of music and the fidelity of the equipment. The turntable in the corner is for special programs

of the rabbit, that is the selection of the music to be played over the system.

This reversal of the time honored recipe has been intentional. It is this element we know the least about. Studies of the physiological effect of music have been made with fruitful results. Everyone has seen a body of troops slogging along converted into a snappy military unit by the music of a band. Panics have been averted by the timely playing of a march. These observations are superficial and are not concrete enough for the director of an industrial music program. The director must know what to play and when to play it.

Marches or Dance Tunes?

Present indications are that music played before the start of the work day should be made of marches and moderately fast dance tunes. Luncheon periods can be utilized as the period for playing employee requests, bearing in mind, of course, that, to some degree at least, musical selections vary with education. The music piped into the engineer's lunch room should not be the same as that sent over the speakers in the general cafeteria.

Selection of "fatigue music" is the most difficult. R. L. Cardinell, formerly of Stevens Institute of Technology, who devoted many years to the study of industrial music, recommends that selections should be arranged in order of increasing stimulus. He observes that the "physiological system (should be given) a gentle push which increases in intensity to a final send off in the form of a fast fox trot or polka." Further, the music should have a well defined melody and rhythm and should be played at a constant volume level.

It can easily be deduced from what has been written that the success of an industrial music program depends upon "what is played when." This presumes, of course, a high fidelity broadcasting equipment. Programming is an extremely complicated operation which requires the talents of an efficiency expert combined with the artistry of a successful showman; to say nothing of other qualifications which can easily be imagined.

There are two approaches to the problem of industrial broadcasting. One is to install high fidelity equipment and then secure the services of a program director. Such a person should not be a fugitive from a broadcasting studio, inoculated with the virus of high pressure advertising. What talents such a person should possess is difficult of definition. Perhaps, the most important would be imagination and courage. He should possess the imagination to initiate the program and to devise testing procedures to determine the validity of the results. He should possess the courage to tailor his program as his best judgment dictates resisting both the banal dictation from the executive above and requests from the workers below.

In addition to the program director who will have full responsibility for the organization and validation of the program there must be an adequate number of technicians available to keep the equipment working to a maximum degree of efficiency. These men must be electronic engineers in the truest sense of the word and not just "knob and tube" electricians who have learned to repair radios by the poke and bang system.

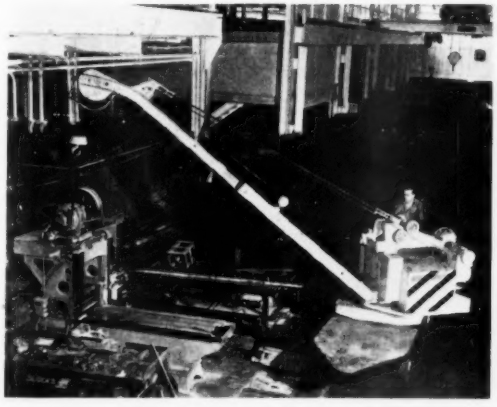
Finally, there must be a fairly substantial investment in records of all types. Nothing palls so effectively as the continued repetition of the same records. This does not mean that records cannot be repeated but the repetition must be managed in such a way that it is not recognizable. The repeating of a record must be likewise weaving a thread into a pattern.

In the final analysis, the decision as to whether an organization will maintain a privately operated industrial broadcasting system is dependent enitrely upon an individual estimate of the situation and the financial gains that will result from increased efficiency. The cost of installation and operation of such a system is considerable and it should be fully recognized that unless it is scientifically installed and intelligently operated the gains in industrial efficiency will not be apparent to say nothing of being real.

Wired Music?

The second approach to the problem of industrial broadcasting is to use wired music from centrally located music studios. It would seem that this is the solution in the greatest number of cases. The advantages are obvious. The capital investment is less. Also, it is not necessary to maintain a program director (if a good one can be obtained in the first place) at a high salary; the programs are especially designed for industrial use. Finally, the program receives the benefit of constant research.

In summation, it can be definitely stated that music does have the power to increase the industrial efficiency of the worker! But, it has to be scientifically applied so as to exert the physiological effects at the psychological moment.



Placement of heavy parts for assembly at the plant of The Foote-Burt Co., Cleveland, Ohio, has been simplified by company's use of its storage battery-powered crane - and - platform truck. Here the operator of this 3,000 lb capacity truck positions a heavy motor atop a piece of machinery at a height of 12 ft, a job heretofore requiring use of overhead traveling crane and several workers

Maintenance and Operation

Nail Puller for Salvaging Lumber

Contributed by
G.B.R., Pontiac Motor Div.

LABOR COSTS and the high cost of lumber were the necessities which mothered the invention of this nail pulling machine at Pontiac. One or two men may operate the machine depending upon how much work is to be done. The stock of used lumber varies, so when one man is sufficient to take care of the backlog of unprocessed lumber he can do so.

If two men are operating the puller they proceed much the same as if they were putting lumber through an ordinary planer. One man feeds the stock over the machine, the other receives it from the opposite end, entirely free of nails and ready for piling.

The lumber must be prepared in advance. All nails must be driven back until the heads project at least 1 in., so that when they pass between the fins of the machine they are caught in the claws and pulled out of the board.

The machine is constructed as follows: An arbor fitted with two claw bars, each having 12 claws, rotates within a protective housing of fins. The speed of the arbor is constant at 96 rpm. Great power is obtained by driving the unit with a 3 hp electric motor through a 12.5 to 1 speed reducer. Transmission from the reducer to the arbor is 1 to 1 through a silent chain drive.

By simple arithmetic we can conclude that the puller is equivalent to 2304 ordinary claw hammers every minute of operation. When the board is fed across the fins, nail heads down, the nails are caught in the claws and pulled from the board. They are cleared from the claws by 10 in. wire brushes rotating in contact and in opposite direction at 1½ times the speed of the claw arbor. The nails are swept by the brushes into a chute built into the machine and they fall into a pan.

Do You Want to See This Machine?

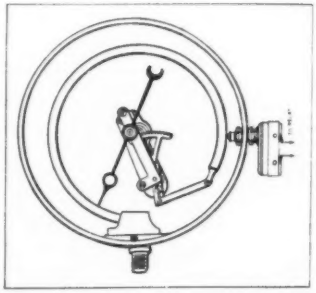
The author of this article states: ". . . no prints have been forwarded in connection with this machine due to the fact that they cover twelve detail drawings for building the machine. We would, however, be glad to show the operation to any reader who is interested. Just drop a letter to The Editor, PLANT ENGINEERING, 53 W. Jackson Blvd., Chicago 4, Ill., and we will forward it to the author of this article at Pontiac Motor Div., Pontiac, Mich.

This nail pulling machine has saved much valuable lumber for Pontiac Motor Division, General Motors Corp., at a cost far below that of new lumber

Control Switch Saves Water

Contributed by
Chas. O. Dyer, Ch. E.

UNTIL RECENTLY the head pressure control valves on our ammonia condensers, which were cooled by city water, had always wasted a considerable quantity of this water. The differential pressure ran from 185 head down to 125.



The pressure tube actuates the switch which, in turn, controls operation of the motorized valve

In order to remedy the situation we installed a Microswitch as shown in the illustration. This switch, when engaged by the pressure tube, powers the motor-operated valve and allows the cooling water flow to take place. When the tube contracts the switch plunger is released and the motorized valve closes. Our saving in water consumption was 850 cu ft every 24 hr.

Break Fluorescent Tubes Safely

Contributed by
John D. Breeding

NOW THAT fluorescent lighting has become a permanent part of industrial lighting, it is well to consider the hazards involved in disposing of old tubes.

Naturally, the first apparent hazard is that of flying glass. To those who have had occasion to break these tubes, the result is obvious. However there is something more to this phase, in that the particles of glass may contain bits of beryllium compounds. These may cause excessive scar tissue to form and at the same time delay healing, when allowed to penetrate beneath the skin surface.

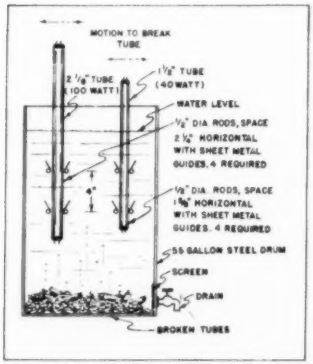
Next there is the possibility of inhaling some of the beryllium compound dust. This possibility becomes

progressively worse as greater numbers of tubes are handled.

There is also the possibility of inhaling bits of the mercury vapor.

From this outline of hazards, it is readily seen that adequate means for safe disposal are necessary, regardless of the number of tubes involved. However the method of disposal will depend upon the number of tubes to be handled.

As a guide to the selection and design of these methods there are several approaches. First there is the "Underwater" method, whereby the tubes are broken under water and the water flushed away. For small scale users this is probably the safest, easiest and most economical method. This can range from an ordinary 55 gal steel drum, with slight


MOTION TO BREAK TUBE
2 1/8" TUBE (100 WATT)
1 1/8" TUBE (40 WATT)
WATER LEVEL
1/8" DIA. RODS, SPACE 2 1/2" HORIZONTAL WITH SHEET METAL GUIDES, 4 REQUIRED
4"
1/8" DIA. RODS, SPACE 1 5/8" HORIZONTAL WITH SHEET METAL GUIDES, 4 REQUIRED
55 GALLON STEEL DRUM
SCREEN
DRAIN
BROKEN TUBES

This is but one of several safe ways of disposing of old fluorescent tubes. The important things are: don't let flying particles of glass hit exposed skin; don't inhale the beryllium compound dust nor the mercury vapor

modifications, as shown in the sketch, to many more tanks and breaking devices.

Another method is to construct a well-ventilated chamber which will protect the operator from flying glass, dust and vapors. Even in this case the broken glass should be wet-down and the ventilated hood or chamber should exhaust through a wet dust-collector.

Under no circumstances should the tubes be discarded without breaking. Neither should they be placed in an incinerator. If not broken and the coatings rinsed away they would provide a hazard to unknowing persons.

Tubes may be placed in their original containers and mashed. In this case the operator should be out-of-doors, suitably protected from flying glass and standing so that the wind is blowing all dust and vapors away from him. Of course this operation can be performed indoors when all of the precautions are met. However even in this case it is recommended that the broken glass be confined, collected and wet-down and the wetting agent flushed away.

Safety Features On Yard Crane

Contributed by Myron C. Ziemke

A BRIDGE CRANE of 5-t capacity located in our heavy plate stock yard, proved to be too expensive to maintain. The control cabinet was almost inaccessible due to its location up on the bridge girder. An extension ladder was needed to reach that elevation and it had to be set up twice, once to one side of the cabinet to open the doors and the second time to place the ladder ends on the door sill so the electrician could reach the numerous relays and make adjustments. With the ladder in place the crane could obviously not be operated, except for the hoist motion. This left much to be desired from a maintenance point of view since the several other relays could be properly adjusted only with power applied.

By way of eliminating this serious handicap a steel platform and guard was constructed of angle iron, plank and expanded metal screen. From this platform the electrician can make any and all adjustments to the relays with the crane in motion. An assistant manipulates the pendant controller seen at the left in the photograph.

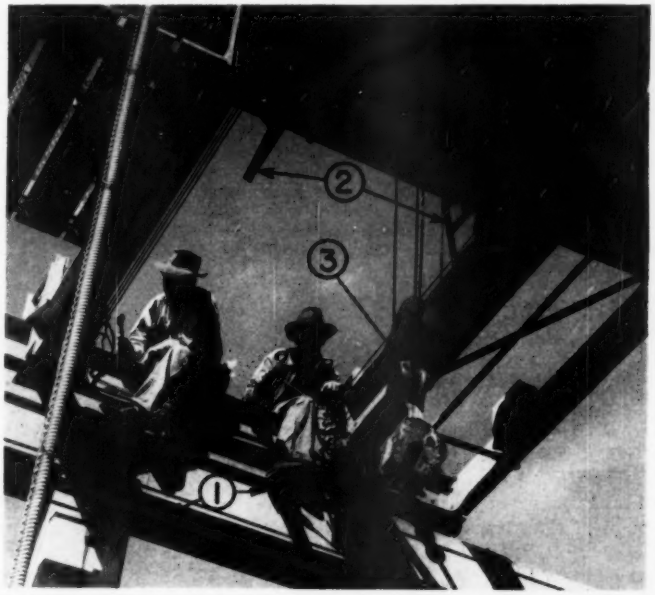
For the protection of the main trolley feeder wires, paralleling the concrete girder, a heavy angle guard (1) was assembled and placed in position by arc welding. This guard keeps the hoist cable from electrical cross-overs with the trolley wires and prevents power outage and burned hoist cables and trolley wires. This guard appears just under maintenance men's feet.

Since much of the hoisting has to be done from angles other than the perpendicular considerable swaying of the load-in-transit occurs. Therefore, two additional angle iron guards (2) were fabricated to be placed in parallel with each bridge girder. These guards not only offer the protection mentioned above but also cover the rather fragile current collector assemblies seen in place behind each guard.

In line with these safety devices a throat latch (3) was installed on the hook so that no matter how greatly the load might sway it could not disengage from the hook. It is spring-closed and can be opened by the mere pressure of one finger on a protruding button.

The final touch of refinement consists of a heavy sheet metal roof supported on angle frame work and erected by arc welding and bolting. This roof fends off the heavy and consistent winter rains, plus frost and snow. The protection prolongs the life of the vulnerable insulation of the three current collectors, the motors and the contents of the relay cabinet.

One coat of red lead primer and two coats of aluminum paint have given this crane ample protection against the elements for some years to come. Its dressed-up appearance makes it a matter of pride for the operators and the maintenance men to keep it in tip-top shape and appearance at all times.



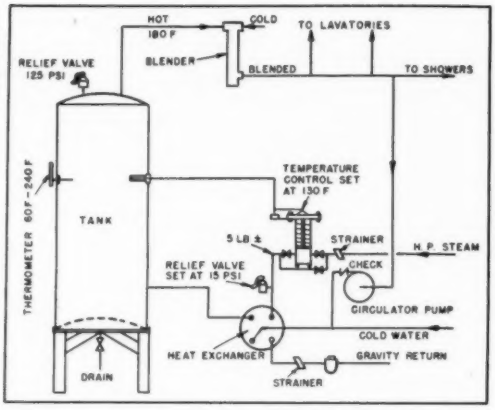
The three numbers on the photograph refer to three of the additions made to this crane. Better maintenance at lower cost and greater safety resulted

Continuous Hot Water

Contributed by
E. V. Lewis, Asst. Pl. Engineer

PROVIDING a continuous supply of hot water in sinks and lavatories is one of the tougher problems of the plant engineer. Water is either too hot or too cold and no one seems to be satisfied. I first started experimenting with this problem about 10 yr ago, and finally evolved what I believe is a satisfactory layout for most hot water problems. This hookup has been adapted to both large and small supplies with complete satisfaction. We are successfully using this system with resulting temperatures ranging from 110 F for workers' showers to 180 F for the cafeteria dish water.

The sketch shows several points which are quite a departure from generally accepted practice. The circulation pump runs 24 hr a day and is installed with a union at each side making it readily replaceable in case of failure. This makes available, at all times, water heated to the proper temperature and eliminates hot and cold spots in the system. There is, in reserve, a full tank of water at just the right temperature plus whatever amount is contained in the return and feed lines. Blending of the heated water takes place while it is being used. If the building is four or five stories high, then the water will circulate itself, and the pump may be omitted.



A hot water hookup like this, says Reader Lewis, will eliminate a lot of usual headaches and will also give you hot water properly blended

Note the location of the thermostatic pilot control bulb. It was only after long discussion that this control bulb was located in the top hole of the standard tank. This was to eliminate the ups and downs in temperature that sometimes result from locating the bulb at other points. The thermometer is set directly opposite the control bulb. The thermostatic pilot for the steam regulator can thus be set at any desired temperature.

Five pounds steam pressure should be enough for ordinary heating. The lower the pressure can be set the more uniform the resultant temperature will be.

Be sure that the line between the reducing valve and the heater is at least as large as the opening into the heater.

Be sure to not use a bushing in the heater. The steam return should be gravity, even if you have to place the heater at the ceiling. I have done this in some cases, and it will eliminate the crackling noises that sometimes result from back pressure.

A Booth for Parts Cleaning

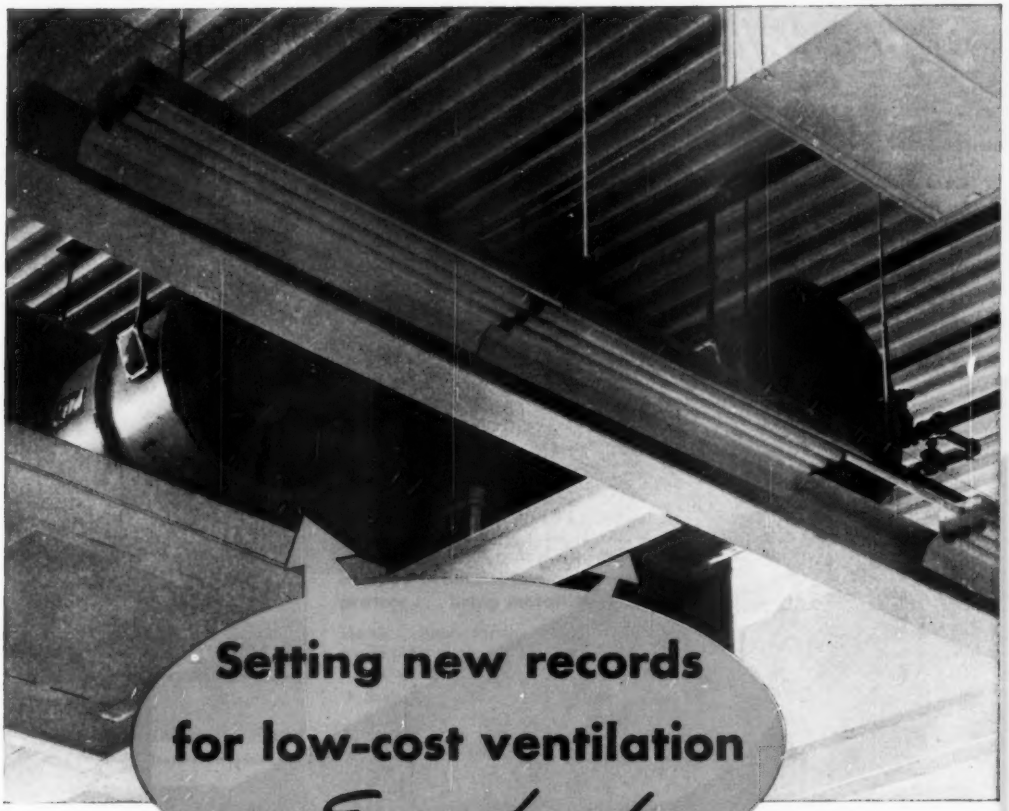
Contributed by Herbert Bouton

THIS UNIQUE cleaning booth encountered in a heavy maintenance shop, would be useful in many plants where motors or others parts accumulate considerable quantities of dust and dirt.

An adequate suction fan was installed, in the basement of the repair shop, with its suction pipe leading up to the floor above where it terminated at the floor line with a 6 ft square screen on which the motor or part to be cleaned was set. As shown in the photograph, a box, 6 ft to the side, and hinged to the floor, was lowered over it. The weight of the upside down box was well counter-balanced to make manual handling easy. When in working position, the booth covered the job snugly.

Near the top on two sides were rubber covered ports with slits cut across them. Lights illuminate the work inside. The operator passes his air lance through any ports he chooses and, entirely protected from dirt, plays the air stream over the part to be cleaned. The suction fan takes all light dust away at once while heavier material falls down the suction pipe and is collected by a hopper built in its bottom. From here it is dropped into a small bin with the aid of an electric vibrator which jars the sheet metal sides of the hopper when necessary to urge the heavy dirt on its way.

Visual inspection and safety for the operator are afforded by this tip-up booth for parts cleaning



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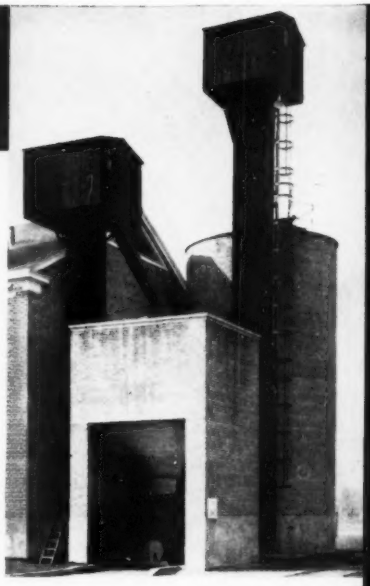

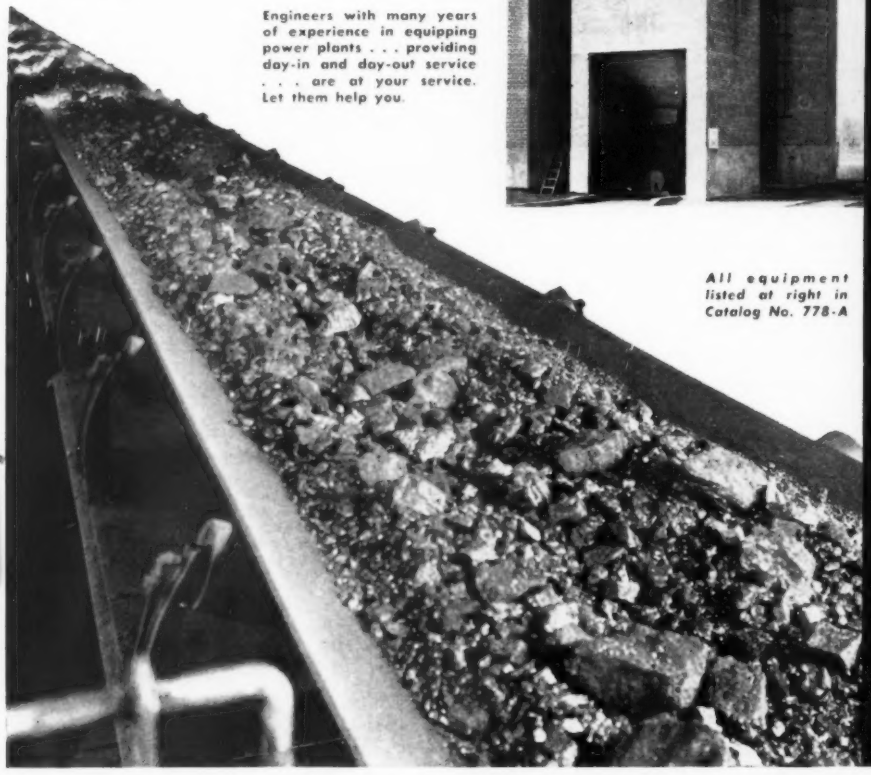

All equipment listed at right in Catalog No. 778-A

- Apron Feeders
- Ashes Handling Systems
- Bin Valves
- Belt Conveyors
- Belt Idlers
- Bucket Elevators
- Chains
- Car Pullers
- Crushers
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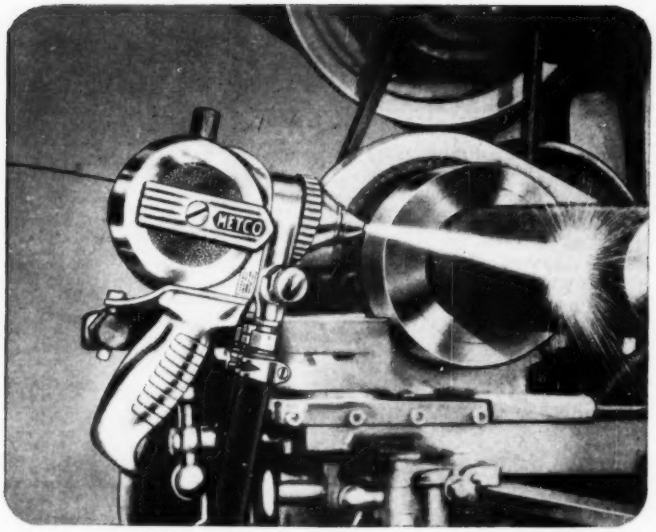

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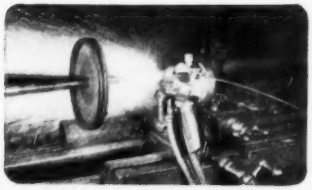
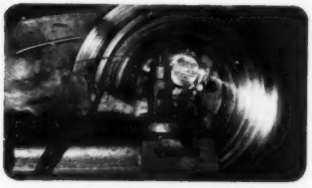


Metallizing damaged journals on turbine shaft



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New, low, compressed-air requirements . . . only 10 cfm at 40 to 60 psi, already available in many shops, or supplied by inexpensive 3 hp compressor . . . bring metallizing within reach of the small user.

Here's a chance for the smaller maintenance shop to get into profitable metallizing operations like these:

- Save up to 90% of replacement costs on machine repair jobs,
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It's Versatile—Use the L-Gun machine-mounted or hand-held—it weighs only 4 lb. 2 oz. Do all kinds of metallizing work—shaft and bore build-up with harder, longer wearing metals; build up worn pump plungers, crankshafts, motor shafts; apply corrosion-resistant coatings. There are hundreds of different jobs that are "naturals" for metallizing.*

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*Where NOT To Use Metallizing—Metallizing is a practical, low-cost method of performing literally hundreds of maintenance and production operations. Briefly, it can be used wherever metal build-up is desired—*except* 3 types of parts; those subject to *impact* (such as dies, punches); *point stress* (ball bearings); or *elongation* (gear teeth, threads). Use it anywhere else, but whenever in doubt just drop us a line.

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Bulletins . . . . Catalogs

BUILDINGS AND MAINTENANCE

101 Roofing Application Data—This 4-pp data sheet is offered to help plant engineers prevent roof failure caused by unusual climatic conditions or atmospheric concentrations of smoke fumes and other corrosives. It suggests usages for exterior building applications of soft-temper Monel roofing sheet and furnishes information on its availability and relative cost. Also includes fabricating and installation tips and a specification wording for use when specifying Monel. The International Nickel Co., Inc.

102 Floor Patching Cement—This 4-pp folder tells plant engineers about a permanent cement floor patching and surfacing material developed to cure "floorosis." It explains how this surfacer is compounded to set fast, dry hard and bond to a cement base. It discusses its advantages in terms of economy, overnight drying and ability to withstand abuse of heavy duty traffic. Contains instructions on how to apply it, and includes photographs showing a badly rutted floor and the same floor after an application of this surfacer. The Midland Paint & Varnish Co.

103 Floor Care Manual—"The Tornado Method" is a 34-pp booklet of especially value to plant engineers because it covers practically every problem of floor care. Describes necessary equipment and procedure to be followed with both old and new floors of every type and composition and includes a stain removal chart. Emphasizes importance of a maintenance program and proper supervision of it. Provides specific instructions for each type of floor. Gives complete information on brushes, discs, holders and pads with instructions for removing old finishes, bleaching, sanding, sealing, waxing and polishing. Breuer Electric Mfg. Co.

104 Steel Shelving Catalog—All-purpose industrial steel shelving is covered in 22-pp Catalog No. 245. It describes and illustrates general construction features of the line. Discusses uses for both open and closed types of shelving and lists necessary parts and accessories, also rotating storage bins. Tells how to order steel shelving and explains engineering and erection services offered by manufacturer. Includes specifications and dimensions, photographs of shelving parts and complete assemblies. The Frick-Gallagher Mfg. Co.

105 Metal Partitions Data—Movable metal partitions as a solution to the problem of flexible division of interior space are well covered in Catalog No. 49-C, 44 pp. It discusses their economy, design, structural stability, adaptability to changing space needs and provisions for electrical wiring. Also explains their construction and sound deadening and light reflection treatment features. Amply illustrated with installation and construction photos and drawings, the book also contains complete specifications. It's divided into sections dealing with metal wall linings and various types of partitions, all custom built to individual plant requirements. The Mills Co.

106 Pulpit Enclosures—This 4-pp bulletin describes streamlined, air-conditioned operators' pulpits for rolling mills, blast furnaces and wherever one-point control is required. It discusses the advantages of greater safety for operators and improved mill production offered by these comfortable enclosures and lists available sizes. Includes a photo of a typical installation as well as plans for both small and large pulpits and a portable utility building. Lee Wilson Construction Co.

107 Maintenance Brush Catalog—More than 250 brushes for painting, varnishing, calcimining, and scrubbing and cleaning are listed in this 18-pp catalog. Each listing includes illustration, description and sizes available. Booklet also provides helpful suggestions on the care and cleaning of brushes. United Shoe Machinery Corp.

BOILERS

108 Steel Boiler Catalog—Low and high pressure boilers for heating and for power and process steam are illustrated and described in detail in General Catalog 80.

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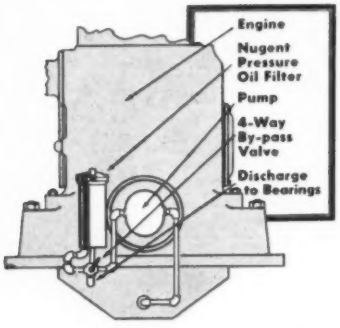
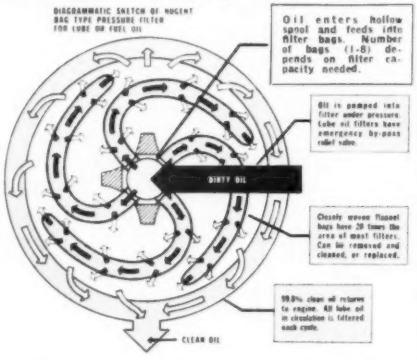
Nugent bag-type lube and fuel oil filters with expendable bags have 20 times more filtering area than other filters of comparable size. Using a Nugent filter, you'll be able to clean *more* oil per hour, *with fewer* changes of filter elements. This is particularly important in full-flow systems, where all the oil in circulation each cycle is being cleaned.



The illustration at the left shows a Nugent full-flow filtering system. Note that the oil is handled by the engine oil pump—no other pump is needed. Filtering systems of this kind are ready for power equipment of any size. Ask a Nugent engineer to give you full details.

The diagrammatic view below shows the tremendous filtering surface of a single bag type pressure filter. The bag, designed to be used and discarded, is made of a closely woven lintless material which removes particles as small as a few microns and delivers oil 99.8 per cent clean. This type of filter is ideal for filtering all the lube oil in circulation every cycle before the oil goes to the bearings, thereby removing the dirt as soon as it gets in the oil, and retarding the formation of sludge and acidity. The dirt-filled bags are easily removed without tools, and are inexpensively replaced.


DIAGRAMMATIC SKETCH OF NUGENT BAG TYPE PRESSURE FILTER FOR LUBE OR FUEL OIL
Oil enters hollow spool and feeds into filter bags. Number of bags (1-8) depends on filter capacity needed.
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24 pp. It covers steel boilers for oil, gas, or stoker or hand fired coal, and includes photographs, complete dimensional data, ratings and specifications. Kewanee Boiler Corp.

109 Steam Boiler Bulletin—A fully-automatic, packaged steam boiler unit that's custom built at the factory to meet conditions of individual installation is described and illustrated in Bulletin 505-B, 1 p. It explains the boiler's dual operating controls which permit operation at high pressure (150 hp) for power and process service, and at low pressure (15 hp) when boiler is used for heating only. Also discusses merits of dual safety controls. Johnston Bros., Inc.

110 Steam Generator Data—Described as a data book for engineers and architects, this is a collection of approximately 100 pp of excellent information on automatic and semi-automatic steam generators in sizes up to 500 hp. Should be of value to anyone planning to install a steam generator, since it not only provides information about the generators themselves, but also provides installation tips and boiler room layouts. The book includes recent bulletins published on manufacturer's line of generators as well as data sheets giving general information and specifications on different models available for gas, oil or combination fuel operation. Also includes photos, sketches, cross section drawings and dimensional diagrams. In loose-leaf binder. Cleaver-Brooks Co.

MECHANICAL POWER TRANSMISSION

111 Belting Catalog—The advantages and applications of "Veelos" balata belting, a heavy-duty, waterproof V-belting for power transmission, elevating and conveying, are given in this 4-pp catalog-folder. It also gives specifications, lists prices and contains several photos of these belts in actual service. Manheim Mfg. & Belting Co.

112 Speed Variator Bulletin—A speed variator designed for d-c performance from a-c power and providing smooth speed variation up to 16 to 1 is described in 4-pp illustrated Bulletin GEC-280. It lists advantages and applications of the variator and describes its construction and operation. Also gives ratings and dimensions. Apparatus Dept., General Electric Co.

113 V-Belt Wall Chart—Plant engineers are offered a handy cardboard poster, $13\frac{1}{2}$ x $21\frac{1}{2}$ in., designed especially for use on stock room and machine shop walls. It's fully illustrated with photographs and shows how to measure, uncouple, couple and install Veelos link v-belt. It also includes a v-belt comparison length table. Manheim Mfg. & Belting Co.

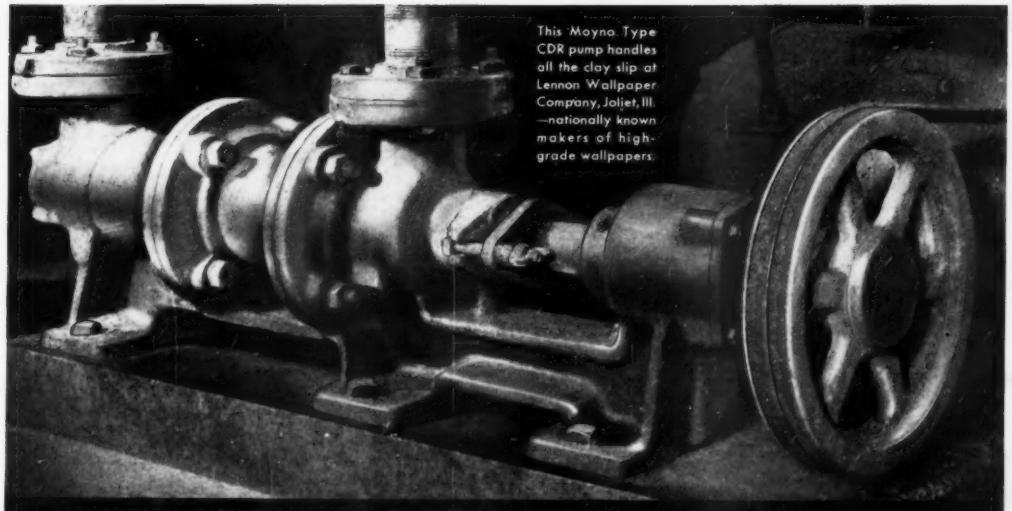
HEATERS, AIR CONDITIONING

114 Fan Heater Bulletin—Here's a 2-pp illustrated bulletin (No. 109) on a new high pressure steam fan heater designed for complete utilization of both sensible and latent heat of high pressure steam. One page is devoted to description and photos of the heater. Other page contains a sketch in color showing how the heater work. Niagara Blower Co.

115 Space Heaters—Bulletin 523, 12 pp, covers forced air space heaters, direct-fired by oil, gas or combination fuel and ranging in output from 400,000 to 2,000,000 Btu, for comfort heating, year-round ventilating, tempering make-up air, process drying and heat curing. It discusses their design and principle of heat distribution and lists 18 reasons why these heaters are recommended for open space heating. Includes specifications, capacity and dimension tables, sketches illustrating operating principles and construction details and photographs showing heaters in use. Dravo Corp.

116 Unit Heater Data—A general description of manufacturer's unit heaters and accessories, as well as engineering data on them, is contained in Bulletin No. 103, 20 pp. It covers V-belt drive and direct connected units of the floor mounted, vertically suspended and horizontally suspended types. Includes capacity tables for available models, also tables giving Btu constants and steam data. Photos show several models and installations. Clarage Fan Co.

117 Automatic Filter Bulletin — A new model 4-stage, automatic, self-cleaning filter for handling large air volumes and



This Moyno Type CDR pump handles all the clay slip at Lennon Wallpaper Company, Joliet, Ill. —nationally known makers of high-grade wallpapers.

How Lennon CUT Pump Maintenance

...AND GOT BETTER PUMPING, TOO

Lennon Wallpaper Company's experience is a tip on how *you* can get *better* pumping. Maintenance problems disappeared when they installed an R & M Moyno "Progressing-Cavity" pump to handle clay slip (for color coating). After a year's operation, *not even a dime* has been spent for repairs.

"NO TROUBLE AT ALL"

The Moyno has handled over 300,000 gallons of slip, pushing it through a 2½-inch pipe, 180 ft. horizontally and 20 ft. vertically. "We're very happy with our Moyno," says R. Dagon, Superintendent. "It's been running steadily for well over a year, and we've had no trouble at all."

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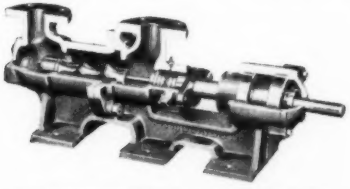
Moynos pump virtually *everything* from volatile liquids to non-pourable pastes. They pass particles and solids in suspension—resist chemicals and abrasives—save maintenance *and money* by constant, dependable operation. They meter flow, self-prime, and reverse; deliver smooth, *non-pulsating* discharge at pressures to 1000 p.s.i. If *you're* having pumping troubles, call in a Moyno man—chances are he has *your* answer, too. Distributors from coast to coast. Write today.



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Please send details and arrange 15-minute demonstration of RAMSET FASTENING SYSTEM. No obligation, of course.

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heavy dust loads is introduced in this 8-pp bulletin. It lists important advantages offered by this filter, tells its applications and describes its construction and operation. Includes specifications, performance data and shipping weights. Illustrations include photos of the filter and parts, and a cross sectional layout of equipment used in central air conditioning. Dollinger Corp.

PIPING, HOSE, TOOLS

118 Piping Materials Catalog—Corrosion resistant valves and piping materials are covered in illustrated Circular No. 320, 32 pp. Contains information on manufacturer's complete line of valves, fittings, fabricated piping and pipe coils to meet a wide range of corrosive conditions. Listing include both photos and cutaway drawings of models, complete specifications, sizes and prices. Includes a description of alloy metals used and a corrosion questionnaire. Also included are several pages of condensed recommendations on the selection of piping materials according to service requirements as well as a pictorial chart showing basic types of valves with names of their component parts. Crane Co.

119 Flexible Metal Hose Catalog—Said to be one of the most inclusive books issued on flexible metal hose products, Catalog G-50, 68 pp. was compiled to give plant engineers a self-contained source of information on the subject. It contains full descriptions and complete specifications and installation data for standard types of flexible hose in a variety of metals. Other sections are devoted to joints for piping systems, stainless steel and brass bellows, and various conduits and special assemblies of these components. Included are photographs showing the testing of materials used in manufacturer's products and photos of flexible hose in use. There's also a chart showing relative metal hose values and an explanation of technical terminology used in the book. Chicago Metal Hose Corp.

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for requesting additional information on advertised products, new bulletins and new equipment. When writing or sending a coupon DIRECT to an advertiser please be sure to mention PLANT ENGINEERING. If you prefer to send your request through us give the item number, or the page number of an advertisement and advertiser's name. If you don't see what you want, ask for it.

120 Rubber Hose Data—Both beverage or "brewers'" hose, and creamery and sanitation hose are described and illustrated in this 2-pp catalog section (3540 and 3640). It tells applications for both types and gives specifications and available lengths, and discusses merits of smooth, easily cleaned tubing. Illustrations show how tubes are covered and reinforced. The B. F. Goodrich Co.

121 Flexible Hose Data—Spiral wire reinforced hose for wide industrial use is described and illustrated in Catalog No. 30, 14 pp. It describes the advantages of th's line of hose, lists the industries it serves and shows, by sketches, many of the common applications. Includes installation data for all forms of this hose, as well as general information and engineering data. Includes specifications and price list America Ventilating Hose Co.

122 Strainer Bulletin—The protection of regulators, instruments and traps against dirt, scale and foreign matter by means of strainers is covered in 4-pp Bulletin 712. Describes and illustrates forged steel strainers; tells how they're built, how they work, how they're cleaned and how they can be applied. Dimensions and weights are included. Photos show strainers, parts and a power plant installation in which strainers are used ahead of steam traps. Edward Valves, Inc.

123 Repair Sleeve Bulletin — This 4-pp folder introduces an improved, lighter-weight repair sleeve for broken or split bells and leaking joints on gas and water mains. It discusses installation and cost advantages of the new sleeve and gives specifications, sizes and prices. Cut-away illustration shows how the sleeve is built;

Floor Space Reduced 50% in Assembly Parts Storeroom

Ohio Corp. Installs Rotabins, Cuts Labor Requirements in Half.

Replacing old storage with modern equipment made possible important savings. Floor space was reduced from 1760 to 900 square feet, without loss of storage capacity. Aisles were wider and better lighted. One man can now do the work instead of two.

Rotabins increase space utilization because every square foot of storage has aisle frontage when needed. Each tray rotates easily on ball-thrust bearings: will not sag or bind when fully or unequally loaded. These rotary units are flexible and may be combined with straight shelving, as desired. A wide variety of tray and drawer arrangements are available to meet specific requirements.

Rotabins are made in many standard sizes to suit a wide variety of needs. Trays rotate around a heavy tubular steel stem secured to a solid circular metal base. Rotabins are durable, portable; require no bracing or fastening. Standard finish is olive green enamel, baked on.

Savings realized from the use of Rotabins can quickly pay for entire investment. Let F-G-M engineers help you plan most profitable layout. Write, 'phone or wire your requirements.

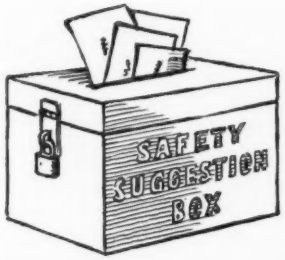
FGM

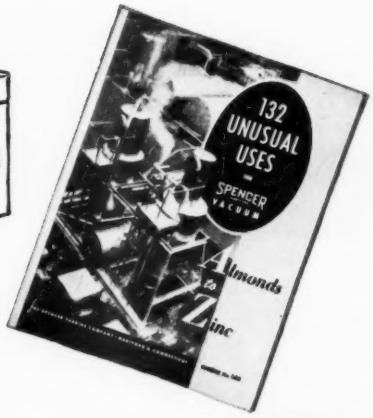
Send for illustrated Catalog No. 106-A

The

Frick-Gallagher Mfg. Co.

SHELVING-PARTS — BINS — RACKS
COUNTERS — TABLES — BENCHES
410 Shubert Bldg., Philadelphia 2, Pa.





132 NEW IDEAS WITH SAFETY AS AN EXTRA DIVIDEND!

Here is a book full of ideas for accomplishing difficult production tasks with great speed, accuracy, and reduced costs, and yet every one of the suggestions might well be dropped into the Safety Suggestion Box.

For instance, Spencer Vacuum handles hot materials such as ashes and cinders, and cleans out the bottoms of 30 foot car wheel pits while still hot.

Conveying of chemicals, foods, silica sand and other materials by the ton, is accomplished without scattering dust.

Fumes from autos in repair shops, from welding operations and in chemical plants, are collected at their source.

Rock drills used in quarries or for concrete are provided with a hood connected to Spencer Vacuum.

And, with the same Spencer Equipment, floors, walls, ceilings, pipes and all machinery can be kept clean.

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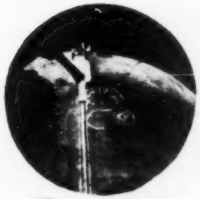
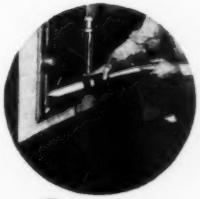


Recovering Welding Flux

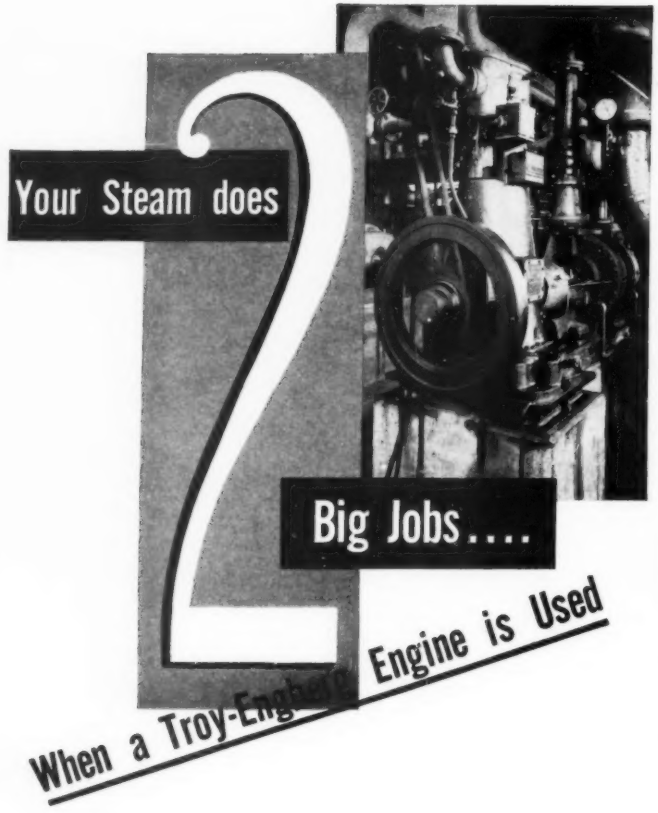
Chemicals



Removing Cocoa Shells

356-D

SPENCER VACUUM CLEANING
HARTFORD
THE SPENCER TURBINE COMPANY, HARTFORD 6, CONN.



With proper plant heat balance your steam may do two big jobs. If you generate steam for processing or heating a Troy-Engberg Steam Engine can produce By-Product Power at a very low cost. The same steam then yields power as well as heat units!

It's the simplest story in the plant. Steam is first passed through the engine — driving pumps, stokers, compressors, blowers or generators. Then the exhaust, with most of the original heat units still intact, is used for processing or heating. And for dependability nothing beats the standard counterflow steam engine . . . no interruptions from power failure.

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(Established 1870)
800 Railroad Avenue Troy, Pennsylvania

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STEAM ENGINES • GENERATING SETS • GENERATORS

sketches show how it is put on. Dresser Mfg. Div., Dresser Industries.

124 Pipe Bending Tools — Pocket-size Bulletin E 201, 16 pp, describes a line of hydraulic and hand operated units for bending iron, steel and non-ferrous pipe, rigid conduit, tubing and bus bars. It illustrates, by photograph, each type of tool and tells its applications, and available sizes. Also describes a power pump for use with the hydraulic units. Stresses economy and efficiency of these portable units for making tailored bends on the job. Greenlee Tool Co.

INSULATION

125 Industrial Insulation Catalog—Mineral insulations for practically every industrial purpose are covered in this 20-pp illustrated catalog. It describes in detail insulating cements for both high and low temperatures, high temperature block insulation, block finishes, felts, blanket insulation, pipe coverings, loose wool, weatherproofing and stack paints. While each class of insulation is treated differently, its description includes information on what that insulation is, what it is for, what it can be expected to do, how it's applied, how it's packaged and, in most cases, how much it costs. Book includes many photos and a general discussion of the requirements of a good insulation and how manufacturer's products meet these requirements. Forty-Eight Insulations, Inc.

126 Low Temperature Insulation Booklet—The insulation of low temperature structures is treated in this 32-pp, illustrated booklet. It discusses design economy, need for vapor barriers, construction materials, and typical low temperature structures, giving temperatures and humidities required for cold storage of foods. It describes manufacturer's insulating materials for low temperatures and tells how to use them on walls, flooring and ceiling. Includes information on the insulating of pipes, ducts and columns, and on interior finishes. Also includes specifications and heat transmission table. Owens-Corning Fiberglas Corp.

ELECTRICAL AND LIGHTING

127 Current Limiter Bulletin—This 8-pp booklet introduces the "Amp-Trap," a current limiting device of high interrupting capacity for protection on low voltage currents. It describes the device, its construction and operation, and tells how it differs from a fuse. Discusses its use on new installations and on old systems, and in enclosed safety switches. Actual size photos illustrate traps and mounting bases. Diagrams show performance of Amp-Traps in tests. The Chase-Shawmut Co.

128 Motor Selection Data — Eight-pp Bulletin B-2101 contains information compiled to help plant engineers select motors. It utilizes cut-away drawings to show construction features of protected, open-type motors and totally enclosed, fan-cooled motors. Torque and current NEMA standards are tabulated and explained. Bulletin also gives estimating dimensions, prices and ordering information. Includes photos of several general purpose motors and a discussion of their applications. Reliance Electric & Engineering Co.

129 Electrical Distribution System Catalog—"Feedrail," a complete electrical distribution system for all types of installations requiring a constant source of electric power is described in Catalog No. 20, 32 pp. It tells how the Feedrail is built and how it works. Gives general specifications and illustrates types for use with high-cycle tools, cranes and hoists, test lines, machine tools, also lighting and portable tools. Lists parts and accessories and includes many pages of installation photos, mounting data. Feedrail Corp.

130 Socket Protector—Information about a protective capping device, for light sockets, the Ajusco-Loc, is contained in Circular No. 65C. A small, 6-pp folder, it tells how this device is designed to prevent socket from breaking and thus reduce maintenance and afford increased protection against fire. Circular explains how easily the Ajusco-Loc can be applied and illustrates types available. Adjustable Fixture Co.

131 Electrical Diagram Guide—The purpose and use of electrical diagrams supplied with switchgear equipment are explained in Bulletin GET 1293A. It was written to help those who install, operate or maintain switchgear equipment make the best use of these diagrams. Discusses in

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Sly Dust Filter used for the collection of fine, flour, silica dust in a large southern California plant. Thousands of other Sly Dust Filters are used similarly for suppression and collection of injurious dusts.

Sly pioneered in the development of positive dust collection and were the original patentees of cloth type filter

The most effective—as well as simplest and cheapest—method of collection is by cloth filtration. The Sly Filter uses more cloth than any other and hence has greater filtering capacity.

This additional capacity plus savings in operation and maintenance make the Sly Filter most inexpensive in the long run. Ask for Bulletin 98 and state your condition so that we can write you fully.

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DART UNION

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MONEY-SAVING QUALITIES

2 NON-CORRODING BRONZE SEATS

Dart economy begins with the two precision-ground seats which, being made of bronze, are non-corroding.

LEAK-PROOF BALL JOINT

Ground to a *true ball joint*, the seats close easily to a drop-tight, leak-proof connection, and open just as easily for repeated use.

HEAVY PROTECTIVE SHOULDERS

These extra-heavy shoulders enable Darts to withstand strains and abuse.

EXTRA-STRONG BODY

High-test, air-refined malleable iron body and nut are practically indestructible.

Always Specify DARTS — because in length of service they cost least.

E. M. DART MFG. CO.

Providence 5, Rhode Island

DART UNIONS

- A good strainer protects your equipment and pipelines. The most important part of a strainer is the screen.
- *Screens* used in Yarway Strainers are made of high-grade monel woven wire having small triangular openings fine enough for required stoppage of dirt, rust and scale, but having ample free area for passage of clean condensate, oil or other fluids. Mechanical strength is greater than ordinary mesh. Perforated screens if desired.
- *Screen cap* is made with straight thread, machined face and spark-plug-type gasket, insuring tight joint. Screen comes out with cap for easy cleaning... automatically aligns when replaced.
- Iron and steel bodies of Yarway Strainers are cadmium-plated for protection against corrosion and better appearance.
- Six sizes, ½" to 2". Hundreds of thousands in use. Stocked and sold by 150 Mill Supply Dealers. See your local supply house or write for Bulletin S-201.

YARNALL-WARING COMPANY
145 Mermaid Avenue **Philadelphia 18, Pa.**

YARWAY STRAINERS
"Police the Pipelines"

detail one-line, elementary, connection and interconnection diagrams. It tells their scope and uses and illustrates symbols used and common variations and explains ASA device function numbers and conventions. Apparatus Dept., General Electric Co.

132 Planned Lighting—Better seeing on each job and better production at lower cost are emphasized in this 6-pp catalog-folder describing balanced lighting units. Contains two pages of photographs illustrating work requiring close lighting and recommends lamps and wattage necessary for these jobs. It also lists light levels or illumination required to light work areas in various other industrial jobs and illustrates several available models with sizes, prices, and recommended applications. The Fostoria Pressed Steel Corp.

PUMPS, COMPRESSORS, CYLINDERS

133 Motor Pump Data—The design, construction and performance of combination motor-pump units are discussed in Bulletin MP-101, 6pp. Includes cut-away illustration of unit and photos of complete assembly, a 2-pp performance table and dimensions. The Frederick Iron & Steel Co.

134 Compressor Drive Handbook — The short center leather belt drive, its operation and advantages for driving compressors, fans and pumps are described and illustrated in this 16-pp handbook. It discusses basic requirements of efficient drives and shows how these are suited for the work. Includes a chapter on the importance of belt tension, many illustrations. Pictures of installations show belt drive in red against black-and-white of rest of photo for clarity. J. E. Rhoads & Sons.

135 Cylinder Catalog—Low pressure cylinders are covered in illustrated Catalog 236, 20-pp. It includes dimensional drawings, construction features and capacities for all standard sizes as well as information on mounting brackets and cylinder cushions, and selection data. Cut-away illustrations of models show construction, and one page is devoted to general recommendations. This catalog also describes a slide-rule type of cylinder calculator available to plant engineers. It gives quick answers to questions on speed of cylinders, size of pumps, valves and other parts. Hanna Engineering Works.

136 JIC Hydraulic Standards—Plant engineers will find this 16-pp data book a valuable reference source because it contains the complete standards for hydraulic equipment specified by the Joint Industry Committee, including an explanation of symbols used and a glossary of terms. The booklet also describes manufacturer's hydraulic cylinders and presents evidence to show that they exceed JIC standards in many ways. Cut-away drawings illustrate construction features of these cylinders. Miller Motor Co.

INSTRUMENTS AND CONTROLS

137 Motor Control Bulletin—Low voltage motor control units for a-c motors up to 800 hp and d-c motors up to 350 hp are described and illustrated in Bulletin GEA-4939, 8 pp. It explains how these units are easily installed and provide control and protective equipment for large motors. It discusses in detail the drawout air circuit breaker and illustrates, by a series of photographs, its manually operated two-way function. Tells advantages of the unit and industrial applications. Apparatus Dept., General Electric Co.

138 Electro-Magnetic Control Catalog—Designated as Condensed Catalog No. 700, it covers in 16 pp most of manufacturer's line of automatic transfer switches, emergency lighting switches, remote control switches, a-c and d-c contactors, a-c and d-c relays, solenoids, close differential and reverse current relays, field discharge switches, electric heater control panels, elevator control devices, and accessories. It's generously illustrated with photos and diagrams and includes ratings and standard features. Automatic Switch Co.

139 Electronic Timer Application Data—Four-pp Bulletin PC478 contains engineering data on an automatic electronic timer for interval timing, time delay, repeat cycling and programming. It discusses special features of this timer, gives specifications and lists typical applications for which it is recommended. Illustrations include diagrammatic sketches of the in-

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WATER
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through rapid heat transfer

The exceptionally high capacity of the new Temprite Industrial liquid cooler is the result of rapid heat transfer, made possible with the famous Temprite "flooded" cooling principle. A complete system may be installed to cool water, light oils, alcohol and certain chemicals, without the necessity of employing space-consuming storage tanks. For example, the compact 54"-high Temprite will deliver 1185 gallons per hour, reducing the temperature from 60° to 40°. Details on request.

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Products Corp. *55 Piquette, Detroit 2*

24-Piece
HEAVY DUTY UTILITY SET
For Production and Maintenance

Here's a practical selection of wrenches with a ¾" handle drive that includes 18 Loxockets providing sizes from 15/16" to 2". A ratchet, sliding bar head, nut spinner head, and three extension bars, 3", 8", and 16" are included. Complete in red enameled metal box.

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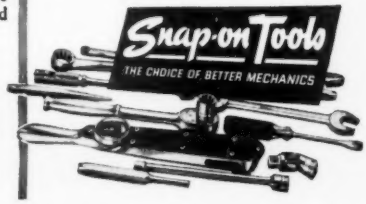
You can be assured of uninterrupted, smooth-flowing assembly and maintenance operations by using Snap-on wrenches for all phases of production work or when unforeseen difficulty arises. There's a Snap-on wrench for every nut-turning operation! Snap-on combinations, like the one shown above, are highly versatile tools, combining speed and safety with the powerful leverage needed in many bolt-tightening operations. The result is better production and faster maintenance through proved working performance. Available through 40 direct factory branches located in key industrial areas.



strument itself and application layouts. Photoswitch Inc.

140 Oil Testing Equipment Bulletin—An inspection kit developed for measuring contaminants in lubricating oil of engines and turbines is introduced in 3-pp Bulletin No. 300. It illustrates the complete kit, centrifuge, dilution indicator and rack for tubes and liquids; and furnishes complete specifications. Tells what the kit is equipped to do and gives brief instructions for running several tests. The Gerin Corp.

141 Electric Control Device Catalog—Containing more than 200 pp, this new catalog gives full descriptions and up-to-date technical data on manufacturer's complete line of resistors, rheostats, relays, contactors, motor starters and controllers, as well as control accessories. Technical data includes ratings, specifications and dimensions. Book is generously illustrated with photographs and sketches, contains current prices and lists bulletins published by manufacturers which deal with specific types of control equipment. It's indexed for easy reference and includes both general definitions and definitions of trade names. Attractively bound, has leather-like, loose-leaf cover. Ward Leonard Electric Co.

142 Electric Control Data—General engineering information on the selection and application of automatic electric controls for heating and air conditioning is presented in Catalog F-1753-1, 32 pp. It covers thermostats, motor operated valves, control motors, control systems and packaged units and other control devices and accessories. It's illustrated with photos of models, electrical drawings, sketches and application diagrams. Includes specifications for entire line of controls and necessary ordering information. Barber-Colman Co.

MATERIALS HANDLING

143 Conveyor Belt Data—Catalog Section 2200, 6 pp, describes cord conveyor belts designed for high impact resistance, flexibility and long life. It covers several types of cord belts, illustrates their construction, gives specifications and tells how to select them according to service conditions. Also describes and illustrates special conveyor belts for unusual loading conditions. Lists approximate net weights. The B. F. Goodrich Co.

144 Dock Loading Devices—Hydraulic lifting units which accommodate variations in truck floor and dock heights are described and illustrated in this 4-pp folder. It explains the operation of these units and discusses their advantages in preventing loading bottle necks and losses, preventing breakage, saving time, labor and space, and reducing shipping costs. Contains dimensional sketches and photographs of both the "Adjust-A-Dock" which raises or lowers loading platform to same height as truck floor, and the "Adjust-A-Truck" which raises or lowers the back of the truck or trailer so its floor is on a level with the stationary loading platform. Rowe Methods Inc.

145 Tilting Dock Ramps—This 4-pp folder describes tilting loading dock ramps and truck lifts and illustrates several types. It shows how these ramps can increase the capacity of a loading dock by making it possible to drive small industrial trucks with palletized loads directly into or out of the truck body, to or from loading dock, over a level path. The Wayne Pump Co.

146 Lift Truck Bulletin—Hand and hydraulic lift trucks in capacities from 1000 to 15,000 lb are described and illustrated in Bulletin 4883, 28 pp. Includes design drawings, dimensions and specifications. Contains information on selecting proper model according to floor construction, load sizes, and lift. Also lists trailer attachments, brakes and flange wheels for use with lift trucks. Barrett-Cravens Co.

147 Lift Truck Drive Data—An explanation of the "Dynatork" drive for fork-lift truck power transmission is presented in a 10-pp booklet, TC-24. It tells how this drive works and how it is designed to improve truck's efficiency by making it easier to operate. It's illustrated with photos and sketches and phantom drawings showing the drive built into one of manufacturer's trucks. Clark Equipment Co.

148 Portable Belt Booster—Four-pp Bulletin HP-20-1A describes briefly manufacturer's "Styl-O-Veyor" portable belt boosters. Includes illustrations and specifications for both the senior model, with maximum load capacity of 800 lb, and the junior model, which has a maximum load capacity of 400 lb and may be used for loading freight cars as well as for elevating materials from one level to another. Island Equipment Corp.

149 Portable Belt Conveyor Bulletin—All purpose, high capacity portable conveyors with plain or cleated belts are the subject of 8-pp Bulletin 363. Two pages of sketches illustrate suggested applications for these conveyors and show how they can be adapted to various conditions. Bulletin also contains photographs of major construction details. It stresses economy of these portable conveyors in cutting handling costs of bulk materials. Barber-Greene Co.

150 Crane Catalog—A Diesel locomotive crane of 30 t capacity is described and illustrated in 20-pp Catalog No. 600-L-6. It explains the advantages of this crane, including improved magnet operation, high-speed grab bucket work, increased safety in grapple work and accuracy and flexibility of hook work. Describes in detail the car body, transmission, interlocking gib ring and roller path, clutch assembly, deck machinery and boom hoist. Illustrations include photos of cranes at work and photos showing parts and construction details, also sketch showing safe lifting capacities. American Hoist & Derrick Co.

151 Industrial Cranes—Titled, "Cranes in Industry," 16-pp, Form 1450727, contains more than 40 photographs of cranes at work on construction jobs, in storage yards, handling scrap, and loading freight cars. It explains how crane handling of materials saves time and labor and increases output. It describes and illustrates motor cranes, self-propelled cranes and crawlers of different sizes and lifting capacities used with hooks, magnets, clamshell buckets and other attachments. The Thew Shovel Co.

152 Wire Rope Catalog—In addition to covering manufacturer's line of wire ropes,

Just what's needed—

TO COMPLETE THE PICTURE

Bradley Sanitary WASHFOUNTAINS

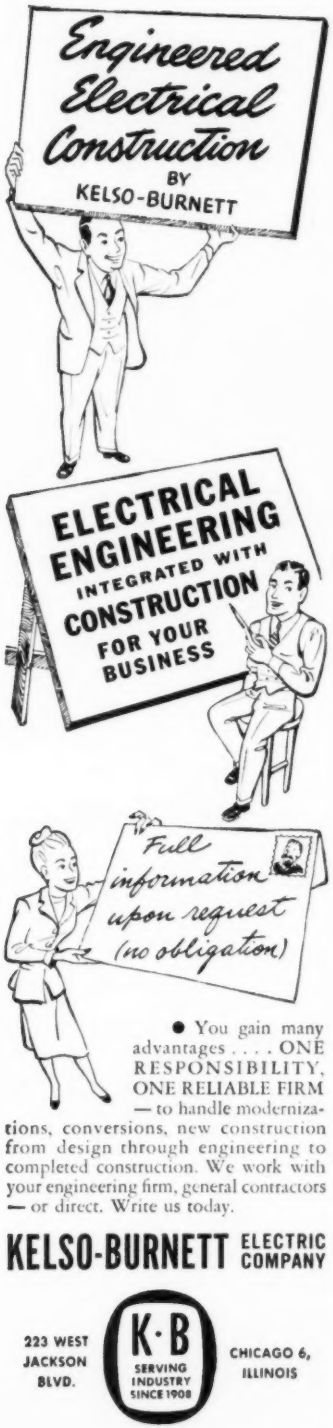
● Modern plant washrooms to be complete need the advantages of Bradley Washfountains. One Bradley serves 8 to 10 workers simultaneously and takes the place of 8 to 10 "single-person" wash basins. The Bradley sprayhead does the work of 16 to 20 faucets, thus reducing the amount of piping needed and saving on installation expense. Furthermore, water consumption is cut as much as 75%.

Bradleys are sanitary too; foot-control operation protects employees' hands from contagious faucet contacts and the self-flushing drain prevents collections of dirty water. Bradleys are distributed through plumbing wholesalers. For further details write BRADLEY WASHFOUNTAIN CO., 2371 W. Michigan Street, Milwaukee 1, Wisconsin.

LEFT: A typical washing-up time scene around a modern, sanitary Bradley Washfountain.

BRADLEY *washfountains*

Send today for free illustrated Catalog 4701.



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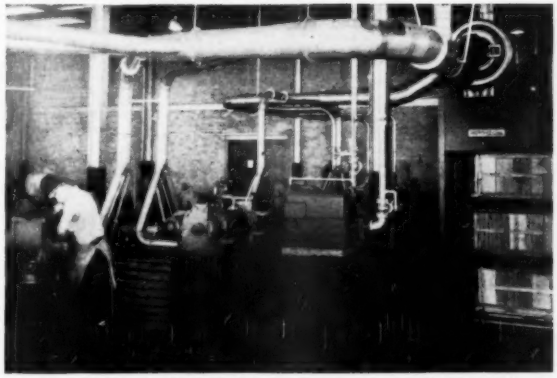
CHICAGO 6, ILLINOIS

ROTO-CLONE gives dust a One-Way Ticket



Battery of stand grinders used for foundry snagging operations is served by two Type D Roto-Clones.

DUST can't linger here to cloud the atmosphere, foul-up equipment and irritate workers. The moment it is generated, it's on its way out via Roto-Clone*.

This battery of stand grinders used for snagging castings is served by two Type D Roto-Clones installed back to back. Note the compactness of the installation. Location of the Roto-Clones at dust source eliminates long, costly pipe runs.

Constant efficiency, uniform air volume, small space requirement, low cost and ease of installation—these are the features of the Type D Roto-Clones that have made this unit a leader in the industry's winning battle over dust.

A Type D Roto-Clone Dust Control System may be installed as a central type with main duct and branch connections (as pictured), or as an individual unit serving a single dust-producing operation. For complete information, call your local AAF representative or write direct to:

IT'S A FACT! More grinders are exhausted by the Type D Roto-Clone than any other type of dust collector. Bulletin No. 272 A tells the story. Write for it now!

MEMBER AIR MOVING EQUIPMENT

AMERICAN AIR FILTER COMPANY, INC.

228 Central Avenue, Louisville 8, Ky.

In Canada: Darling Bros., Ltd., Montreal, P. Q.

**Roto-Clone is the trade-mark (Reg. U. S. Pat. Off.) of the American Air Filter Company, Inc., for various dust collectors of the dynamic precipitator and hydrostatic precipitator types.*

AAF

ROTO-CLONE® DUST CONTROL EQUIPMENT

fittings, strands, slings, screens and flat wire, this 12-pp illustrated catalog contains valuable information on the installation, maintenance, handling and use of wire rope. It also describes and illustrates many of its applications, discusses types of rope cores, and stresses the economy of choosing the proper grade of wire rope. Listings include illustrations, specifications, dimensions and weights. John A. Roebling's Sons Co.

METALS

153 Metal Technology—"Fundamental Characteristics of Revere Metals" is a 63-pp booklet which gives in non-technical language the basic technology of copper, brass and bronze. Among the topics covered in detail are copper and its alloys, cold working and hardness, annealing, and corrosion. An excellent reference booklet, it also discusses specification writing and includes a 7-pp glossary of terms. Revere Copper and Brass Inc.

154 Alloy Application Data—File No. 270 contains the first of a series of engineering sheets published on the application of cerro alloys. Generously illustrated with photos and sketches, these data sheets explain methods of making chuck jaws, binding thin-walled tubing, moldings and extruded shapes, and casting procedure for cerro alloys. Tells equipment needed for these jobs and alloy best suited for particular application. Instructions are clear and easy to follow. Also included is table showing physical properties. Data sheets are furnished in loose leaf binder with space for additional sheets. Cerro de Pasco Copper Corp.

FIRE, SANITATION

155 Fire Facts — "The Chemistry and Control of Fire," is a 12-pp booklet generously illustrated with sketches and written in non-technical language but it approaches the subject from a scientific angle. It discusses the factors necessary to create fire and shows how all methods of fire extinguishing serve to remove one or more of these factors. It describes the operation of commonly used types of fire extinguishers. It also explains how fires are classified by Underwriters' Laboratories and includes data on manufacturer's line of extinguishers. The Fyr-Fyter Co.

156 Industrial Hand Cleanser—The merits of a hand cleanser available in strengths for general purpose and heavy duty use are presented in this 4-pp folder. It tells how this "cereal base" granulated cleanser is processed to remove imbedded dirt and grease quickly, to leave hands smooth, and to work equally well in hot or cold, hard or soft water. It stresses economy afforded by its concentrated cleaning action. Also illustrates and describes a dispenser for use with this cleanser. The Diversey Corp.

MISCELLANEOUS

157 Filtering, Separating — "Little Known Ways to Save Big Money with Fine Wire," is the title of Bulletin 11, 8 pp, concerning separation in mist extraction, gas filtering, tower packing, cleaning and baffling with manufacturer's elements of technical knitted mesh. It describes and illustrates the construction of these elements and stresses economy afforded by using them. Also illustrates recommended installation practices. Includes inquiry sheet. Otto H. York Co., Inc.

158 Pressure Drop Chart for Steam Separators — To facilitate selection of a steam separator for given conditions, this chart is designed for selection of most efficient size and type of steam separator for a specific installation and determination of pressure drop through the separator. Included also is a method for determining pressure drop on oil separator for an exhaust steam line. Three typical examples are given to show method for determining pressure drop. Two tables give steam flow through various types of the manufacturer's steam separators at pressures from zero gage pressure to 250 psig. The chart is also included in a new Catalog No. 500, which describes in detail the various separators for use on steam, oil, air and gas, also exhaust heads, furnished by the manufacturer. The catalog also shows charts of engine and turbine steam ratio and pressure drop and velocity in steam piping. Wright-Austin Co.

159 Cork Vibration Control—Illustrated Bulletin C-1, 4 pp, lists typical applications in which cork may be used to control transmission of vibration and noise, and gives installation data and information on specification writing. It describes and illustrates, by photographs, 5 convenient forms of cork isolation, giving available dimensions and static load ranges. Includes sketches showing recommended installation layouts and photos of several industrial installations. The Korfund Co., Inc.

160 Automatic Oilers — Here's a 12-pp booklet filled with photographs of actual job installations of visible automatic oilers in a wide range of industrial applications. It provides many useful tips on the correct use of oilers. Types illustrated and described include constant level, wick, thermal and gravity fed oilers. Trico Fuse Mfg. Co.

161 Water Demineralizer Booklet — The economy and other advantages of manufacturer's demineralizers are convincingly presented in this 26-pp booklet. It emphasizes the role of demineralizers in providing a low-cost chemical equivalent to distilled water. It explains and illustrates, by colored sketches, how ion exchange can be utilized to remove dissolved solids from tap water; tells how this principle is applied in demineralizing equipment and how this equipment is operated and how to calculate time required for a run. Booklet includes estimate of operating costs in several cities. Describes and illustrates available demineralizer models and gives their specifications. Ion Exchange Products Dept., American Cyanamid Co.

162 Industrial Tape—This small folder contains a lot of information about a sturdy cloth tape with hundreds of industrial applications and available in widths up to 36 in. Folder contains pictures illustrating tape's use in sealing, holding, identifying, protecting, packing, repairing and binding. It lists many of the jobs this tape can do in production work, in repairing and maintenance and in packing and shipping. Sketches show how easily it can be removed from roll, pressed into place and torn off at correct length—or peeled off when desired. Mystic Adhesive Products.

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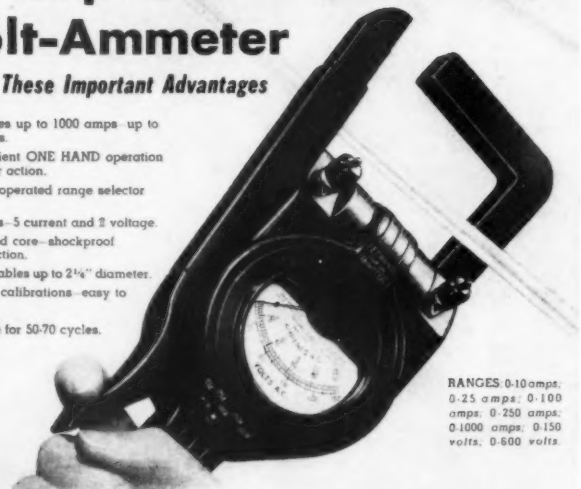

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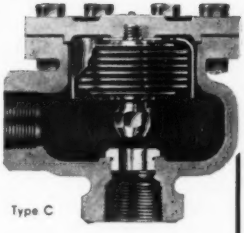

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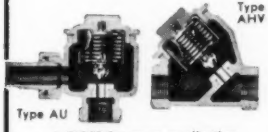

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Artificial Weather *

AIR CONDITIONING by Herbert Herkimer and Harold Herkimer. Size 5½ by 8½ in.; 692 pp. Apendix includes complete terminology, abbreviations and symbols, graphical symbols for drawings, complete index. Published by Chemical Publishing Co.; price, $12.00.

THE PLANT ENGINEER will find, in the last two-thirds of this book, a wealth of practical information on the selection of air conditioning materials and equipment including methods of estimating costs. The usefulness of the volume is considerably enhanced by the problem-and-answer method of approach to various phases of air conditioning.

The first part of the book is devoted to chemistry and physics of air conditioning but the book, as a whole, covers estimation, sales, promotion, installation, supervision, servicing, etc. Industrial applications of air conditioning in various types of industries from bakeries to textiles are covered in capsule form and tables of relative humidities and desirable temperatures and humidities for industrial processes present this information in easy-to-use form. One segment of the air conditioning picture—automatic controls and controlling—which has always been troublesome, is given thorough coverage.

An asterisk (*) following the title of any book described in this department indicates that the book may be purchased from the Book Department, PLANT ENGINEERING, 55 W. Jackson Blvd., Chicago 4, Ill.

Fundamentals of Organization

THE MANAGEMENT GUIDE by George Lawrence Hall. Size 6 by 9 in.; 74 pp; paper bound. Published by the Standard Oil Co. of California, Standard Oil Building, San Francisco 20, Calif. Price $10.00.

UNDER STANDARD of California's Department of Organization, Management Guides have been developed over the past 12 yr. These define functions, responsibilities and authorities and serve as an administrative aid for management and supervisory positions at all levels. This booklet, prepared to meet requests from outside concerns, outlines the development of the guides and is in reality a guide to the preparation of management guides for any industry.

It covers factors which should and should not be included, discusses job descriptions and their shortcomings and the use of the guides at different supervisory levels. Nineteen double page organization charts covering the major departments of a hypothetical corporation are included.

Foundation and Earthwork Engineering *

SOIL MECHANICS IN ENGINEERING PRACTICE by Karl Terzaghi and Ralph B. Peck. Size 6 by 9 in.; 541 pp, plus index; illustrated; copyright 1948; third printing January 1949; cloth bound. Published by John Wiley & Sons, Inc. Price $5.50.

EXPERIENCE, THEORY and soil testing as applied to foundation and earthwork engineering have been well balanced in this book. Part A dealing with the physical properties of soils and Part B with theoretical soil mechanics are short but contain all the average engineer needs to know about these phases.

Part C, the major portion of the book, covers practical problems in design and construction. Discussion of each problem begins with a survey of conventional method and develops step by step progress resulting from improvements and research. Each section is followed by a list of specific references.

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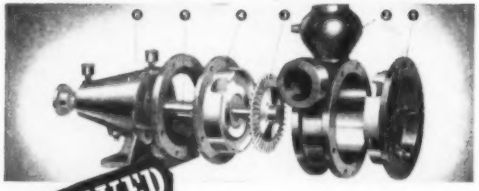

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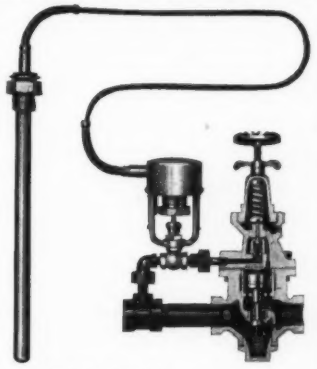

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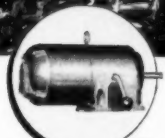

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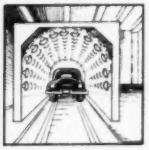

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analysis of data; retaining walls, supports for cuts and slopes, soil stability and soil compacting; dikes, fills and dams; footings and rafts, pile, pier and dam foundations; and settlement due to construction operations, vibration, lowered water table, and deterioration are some of the topics covered in Part C from a practical standpoint.

Highway, airport and tunnel engineering, also highly specialized branches, have been omitted except for a short appendix consisting almost entirely of references. This is a book with which every plant engineer dealing with building or earthwork constructions should be familiar. It reads easily and contains a world of practical and reference material not readily available elsewhere.

Practical Industrial Hygiene Engineering *

INDUSTRIAL HYGIENE and TOXICOLOGY edited by Frank A. Patty. Size 7 by 10 in.; Vol. I, 517 pp plus index; illustrated; copyright 1948; cloth bound. Published by Interscience Publishers, Inc. Price, $10.00.

A MONUMENTAL work on a monumental subject written by 19 specialists under the editorship of Frank A. Patty, Director, Industrial Hygiene Service, General Motors Corp. While some of the contributors are doctors, all are active in the industrial health field so the book is a practical operating manual on industrial hygiene engineering.

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(Continued on page 66)

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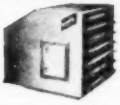

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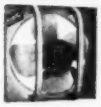

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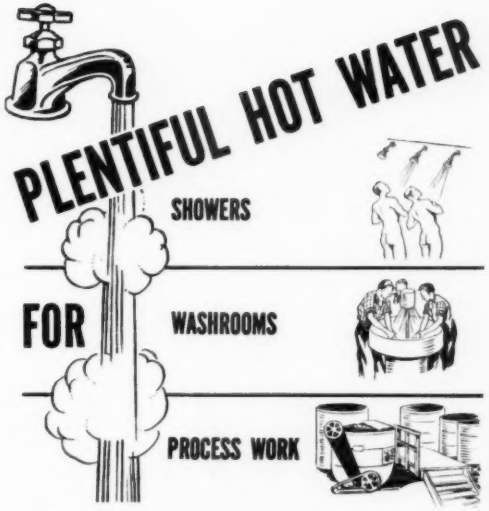

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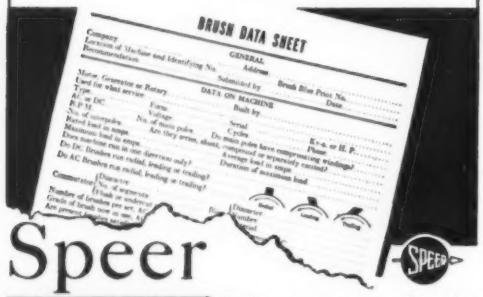

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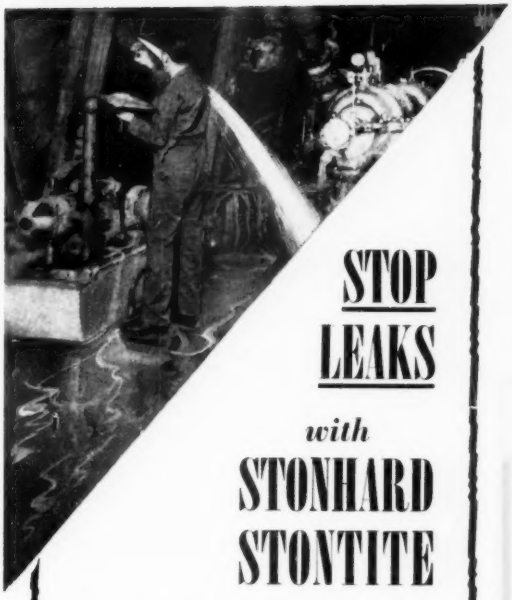

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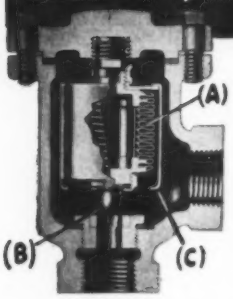

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(Continued from page 62)

chemists and physicists. The physical means of correction is an engineering problem largely: layout or plant design; dust and fume control; safety and ventilation.

Detailed review of the book is not possible. Among the chapter headings, however, are: Industrial Hygiene; Records and Reports; Surveys and Personnel; Factors in Fatigue; Action in Toxic Materials; Sampling and Analysis of Atmospheric Contaminants; Radiant Energy and Radium; Ventilation; Dermatosis; Fire and Explosion Hazards of Combustible Gases, Vapors, and Dusts; and Protective Devices.

Some of these chapters deal with hygiene, psychological and physiological factors of but passing interest to the engineer. Others, however, like sampling and analysis, ventilation, fire and explosion hazards and protective devices are directly down the plant engineer's alley.

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Industrial Hydraulics

NATIONAL CONFERENCE ON INDUSTRIAL HYDRAULICS PROCEEDINGS. Size 6 in. by 8 in.; 154 pp plus registration lists. Published by National Conference on Industrial Hydraulics, Armour Research Foundation and Graduate School, Illinois Institute of Technology, Technology Center, Chicago 16, Illinois. Price, $3.00.

THESE Proceedings contain several papers all of which were presented at the 1948 National Conference on Industrial Hydraulics. Among the papers are "The Polyphase Torque Converter" presented by Oliver K. Kelly with discussions by G. W. Pontius, V. J. Vandasek, E. F. Farrell; "Hydraulic Circuits for Farm Tractors" by J. F. Ziskal; "Flanged Joints—Their Development and the Trend" by E. G. Schmidt; "Hydraulic Packings and Seals" by C. E. Schmitz; "Gasket Design and Selection" by H. H. Dunkle; plus several others.

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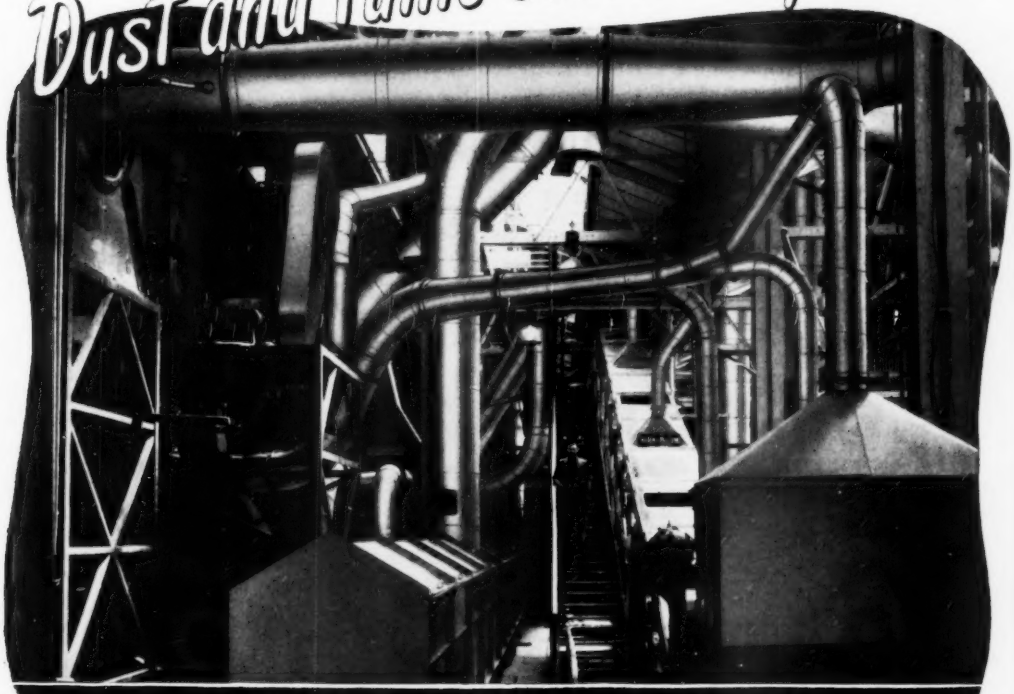

In the large photo, two mold cooling conveyors are shown to left and right of stairway.

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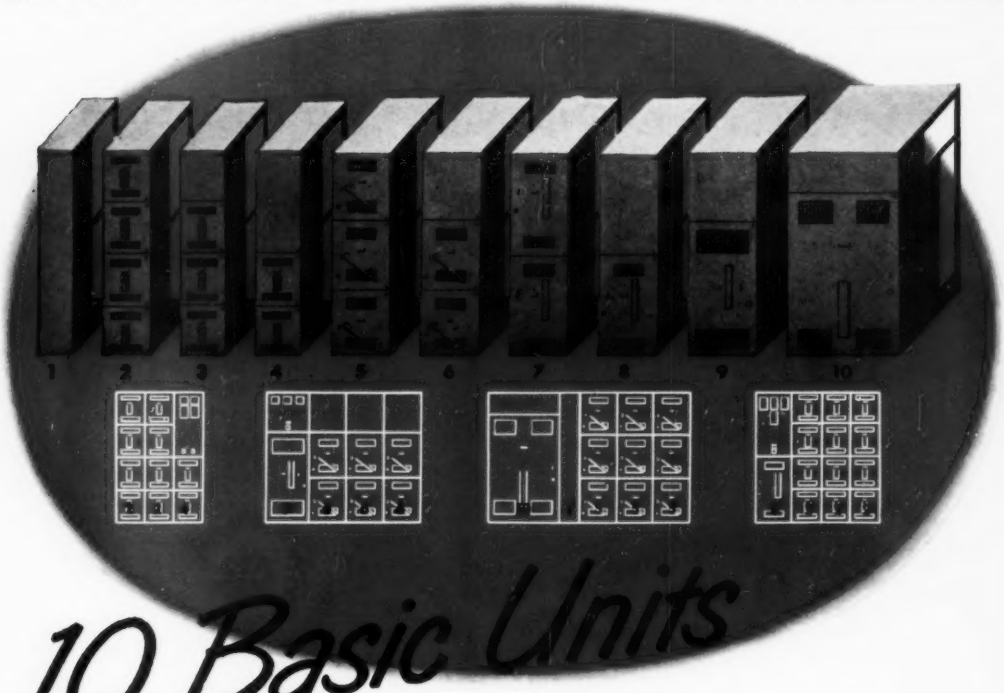

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